Vol. 9 No. 11
FEBRUARY 1948
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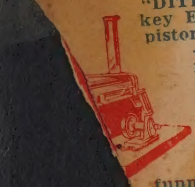
RADIO AND HOBBIES IN AUSTRALIA

6D

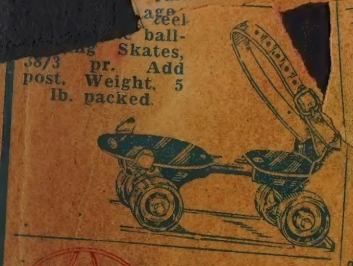
A REMOTE-CONTROL TUNING UNIT

Plastic Moulded Tipperary Flutes. With ...tructions. Easy to play almost at once, 9/3, or 10/- posted

"Cracajac" Air Rifle—possesses tremendous power ...d accurate sighting, very strongly made—perfectly safe, ...- and 2/- posting. 300 slugs supplied with guns, 1/6 extra.

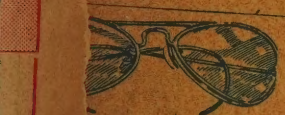


"DITKA" Donkey Engine—brass piston and boiler —beautifully made, ideal for working models, etc! Absolutely safe for children. Complete ... funnel, etc., 39/6.



...cel ball-... Skates, 38/3 pr. Add post. Weight, 5 lb. packed.

English Telsen Microphones, carbon, single button - type. Just hook up to the pick-up terminal of your radio. Great fun for parties, etc. Complete with battery, cable, 20/-. Add 1/6 posting.



...an type SUN ...ptically correct and ...ground lenses 37/6. ...type De Luxe, 52/6. ...un Shields, 20/-. Add ...e to each.

...-point Pen. A revolu... writing. No blotting ... nib, no ink refilling, ...d. 55/-. Add 9d posting.

...EL SEWING MACHINE. Ideal ...or girls that actually sews— ... for small sewing jobs. Beautimade. Complete with clamp, ...2/- post. Available for February delivery.

Box of Four English JEWELLERS' SCREW DRIVERS. Assorted sizes. Special Wooden Box, 9/8, or 10/3 posted.

"WAKOUWA"

The world's greatest novelty. It's a scream. It's a wonder!! Great fun for young and old. Just press the base and he will perform. 7/9, or 8/3 posted.

Magnetic "LOVE PUPS." Screamingly Funny Little Novelties. Fun! and what Fun. They do the most unusual, unheard things, 3/6, or 4/- posted. The pair could fit in a Safety Match Box.

"Durable" English Unbreakable Black Enamelled High Grade Fountain Pens. Inoxydable Nib, pocket clip, Push bottom filler, 22/6, or 25/6 posted.

A Wonderful Range of NEW BOOKS JUST ARRIVED FROM LONDON

Please Add Postage.

How I Toured the World on Nothing, 3/3. Wireless Operating Simply Explained, 1/3. How To Become a Commercial Artist, 2/6. Warships and Aircraft of Japan, 2/-. The Design and Construction of Flying Model Aircraft, 11/-. Model Flying Boats, 3/9. Solid Scale Model Aircraft, 6/9. First Steps in an Electrical Career, 2/6. Combat Without Arms, 2/9. Model Boat Building, 6/-. Simple Furniture Repairs, 1/6. Tin Can Craft, 3/-. How to Work Sheet Metal, 4/11. Boxing, by Jimmy Wilde, 3/-. 100 Chess Problems, 2/6. Tricks with Cards, 3/-. The Latest Radio Inside and Out, 7/3. Everyman's Wireless Book, 8/9. The Mathematics of Wireless, 11/3. The Foundation of Wireless, 12/6. The Outline of Wireless, 21/-. Wireless Operators' Handbook, 1/6.

English SHEFFIELD "Truflite" Throwing Knives With Sheaths.

Just Landed.

6" 12/6; 7½" 15/6; 2 in Set 22/6; 3 in Set, 31/6. Add 6d postage for single knives. 9d for sets.

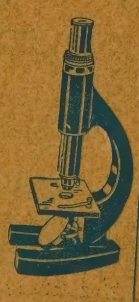
"COLIBRI" Lighter—just arrived from England — Single action, automatic. You will be proud to own one. 39/6, or 40/- posted.

"Percy" THE TALKING PENGUIN

The best novelty yet — children will adore him — non-mechanical, yet ... walks ... a slight down grade, 2/8, or 3/2 posted.

MINIATURE TELESCOPES

Just arrived from England. 3 x 4 Section Optically precision ground and polished lenses, 9/5, or 10/- posted.



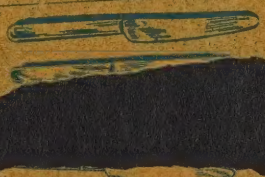
English Microscopes. Beautifully made, just the thing for young scientists. Magnification 100 Complete with slides, tweezers, etc., in polished lock-up Cabinet. £5/5/-. Smaller size, 50 magnification, £3/11/6. 25 Magnification, 29/-. Ideal for younger boys. Add 2/- postage to each.

Plated Metal cased Tobacco Case and Cigarette Maker, Complete. Very Simple, 7/6, or 8/3 posted. Shut to make cigarette on front.

All metal British Potato Chipper, 14/3. Posted and packed, 1/6 extra. Easy, Strong, Safe. One stroke makes a dozen chips.

Upson BINOCULARS

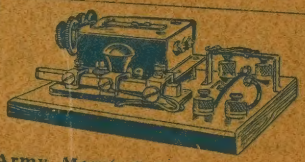
21 x 25. Scientifically designed Fixed focus, plastic lenses, 20/-. Add 9d posting.



Mirror Finish Sheffield Knives, white handles. Table or Dessert sizes. 6 for 20/-, plus postage. All Steel Handle Knife, Dessert size, 6 for 10/-, plus postage, 1/6.

Mix with Spirit Gum or Thin Liquid Glue. 2/9 posted.

English miniature crystal sets—fitted with "Perikon" crystal detector. Approx. average range 10-15 metres Tuning range, 200 - 300 metres, 24/6. Add 1/- postage. Phones 21/- extra.



Army Morse Code Sets. Beautifully made, 10/6. Add 1/6 postage. Battery, 5/- extra.

Suitable Headphones, 10/-. Add 1/- postage.

Rubber Swimming Goggles, 7/3 and 10/6. Add 9d posting. Underwater Masks as used by pearl divers in New Guinea, 21/6 Add 9d posting.

Japanese Pearl Necklaces. Single string, 18/6; Double string, 37/-; Treble, 55/6. Add 9d posting.

J. LEVENSON'S RADIO

226 PITT STREET, SYDNEY.

Games, Hobbies, Novelties, and Slot Machine Specialists. Everything from A to Z in Radio at Sane Profit Prices. Phone M2525 and 2526-7. Goods forwarded C.O.D Post or Rail over 10/- (C.O.D. Rail within N.S.W. only; not interstate).

"We have a good job with a big future for one of your keen A.R.C. men!"

Get into radio NOW! Every day requests are made for trained men to fill good-paying radio jobs. It's a grand opportunity for YOU!

The DEMAND for TRAINED RADIO MEN Exceeds the Supply

Radio is booming, the demand for all types of radios and equipment is sky-rocketing as the popularity of radio entertainment grows daily. Furthermore, the drastic restriction of dollar-spending means that many radio units and components must now be made in Australia.

WHAT DOES THIS MEAN?

This means that the radio engineering industry is crying out for trained men. Big paying jobs are waiting for men to fill them—but they must be trained men—men who know the mechanics of radio thoroughly.

TRAIN AT HOME OR AT OUR BRANCHES

The Australian Radio College offers ambitious men a sound proven course in Radio Engineering. Hundreds of students already owe their success to the college. We can do the same for you.

You can learn with equal facility at home (by means of our correspondence course), or at the modern, completely equipped College workshops.

PREVIOUS KNOWLEDGE UNNECESSARY

You don't need a knowledge of Radio or Electricity. We give you all you need of both in a simple, practical manner that makes learning easy. It's presented in such a way that you remember what you're taught and speedily gain the opportunity to PRACTICALLY use your knowledge.

COURSE COSTS LITTLE

Think of this—for a few pence a day—actually less than many fellows spend on tobacco—you can prepare yourself for a man-sized job in radio NOW!

RADIO IS STILL A NEW INDUSTRY GROWING FAST!

Estimated sales o radios last year ra into many millions The next few year should see figure doubled.

Pre-war radio se output reached a estimated 280,00 This figure shoul be easily passe this year.

Even a 25% increas in sets will mea openings for thou sands more radi trained men.

Over 130 Australia radio stations em ploy a vast nun ber of skilled pe sonnel—this will greatly increas with the advent F.M. transmissio

GET THIS BIG FREE BOOK NOW

First thing to do if you want to get vital radio facts is to send for our big free book, "Careers in Radio and Television." Packed with illustrations of radio and television equipment and engineers at work, this book will show you definite steps you can take for a better job—How you can succeed in life. Post the coupon NOW.

THE PRINCIPAL,
AUSTRALIAN RADIO COLLEGE PTY. LTD.,
Broadway, Sydney. 'Phone M6391-2.

Dear Sir, I am interested in Radio.
Please send me, without obligation on my part, the free book, "Careers in Radio and Television."

NAME .....

ADDRESS .....

AUSTRALIAN RADIO COLLEGE PTY. LTD.

E.S. & A. Bank Building (opposite Grace Bros.), corner Broadway, and City Rd., Sydney. Phone M6391 and M6392.

MAIL THIS COUPON TODAY!

Editorial

YOU will notice when you take up your copy of Radio and Hobbies this month, that it has fewer pages than usual.

No doubt you half expected this to be so, for most people by this time realise the tremendous cuts which have recently taken place in supplies of newsprint.

At the present time, our magazine is printed on newsprint. This is because we produce just on 50,000 copies every month, our usual size being 96 pages. These figures represent quite a big printing job, one which calls for speed in handling beyond the resources of the flat-bed type of press usually employed for smaller journals circulating only a few thousand copies at a time.

For this reason we use the big rotary presses which also print some of our associated journals.

When considering the best way to make use of our paper ration, we decided against any curtailment in circulation. We know full well that although the position during the last two years has gradually improved, there are still plenty of people who have missed out on their copies. To have reduced circulation and maintained a larger paper would have been a rather selfish procedure as far as our readers are concerned.

For the present, therefore, we have decided to standardise on a 64 page paper. It will, however, include all the main features you have looked forward to in the past. Our aim will be to give you just as much material as before, particularly in the constructional and general radio field, but to compress it into smaller space. Our articles will be more concise and to the point, although the same illustrations and circuits will be included to give you all the essential pictorial help you will need.

Fewer pages have meant less editorial space, but at the same time, we have been forced to ration advertising. Apart from reducing our revenue, we know this has disappointed many of our advertisers who will not have the advantage of the large displays they have been accustomed to use. We aren't too happy about this aspect either, as we know that in a journal such as ours, the advertisements have a more than usual reader interest. We are grateful to the helpful and understanding way in which our advertisers have co-operated, for it has been inconvenient for many of them to change their plans for advertisements, some at rather short notice.

To help us make the most of our available space, we are more than ever anxious to have your views on what we should print. We have obtained some very useful leads from reader's letters, the results of which have been worked into articles from time to time. If you have any ideas you think would help, please let us have them. We have no sensitive feelings to be hurt, so let us know, too, if there are any points you think are neglected or not covered.

We are examining the possibility of improving our paper position in the near future, and although we can't say more than this at the moment, we are hoping. And even if we cannot do so, we think you'll still agree that for 6d per copy, Radio and Hobbies is pretty good value!

John Moyle

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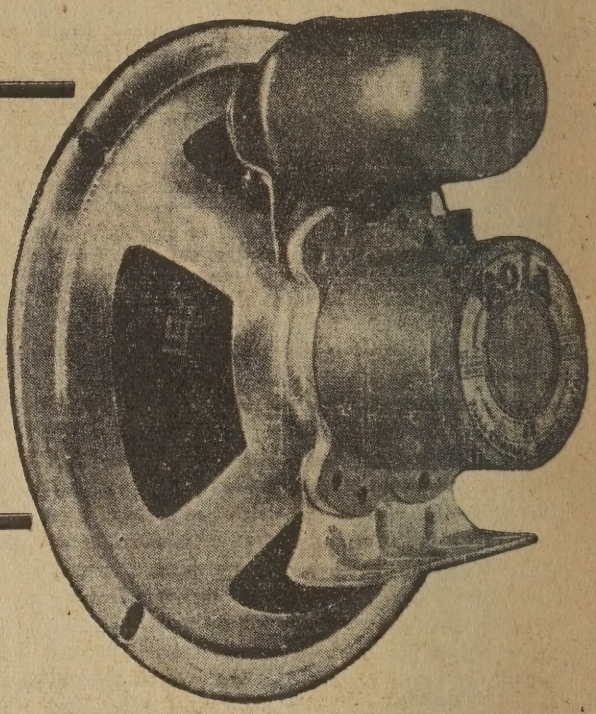
EDITOR: JOHN MOYLE, M.I.R.E. (Aust.) (VK2JU). TECHNICAL EDITOR: NEVILLE WILLIAMS, A.I.M.R.E. (Aust.) (VK2XV).

ROLA PRESENT THEIR NEWEST SPEAKER MODEL 6K



The new Rola 6K Speaker is the most highly efficient 6″ Speaker available in Australia. Specially designed to provide the extra speaker efficiency required by portable, battery, and vibrator operated receivers. Can be used in A.C. receivers if desired.

Similar to Rola 6H Speaker in appearance and dimensions, the new 6K Speaker has an Anisotropic Alnico Magnet enlarged to provide extra flux and is fitted with an Isocore Transformer of exceptionally high efficiency rating.

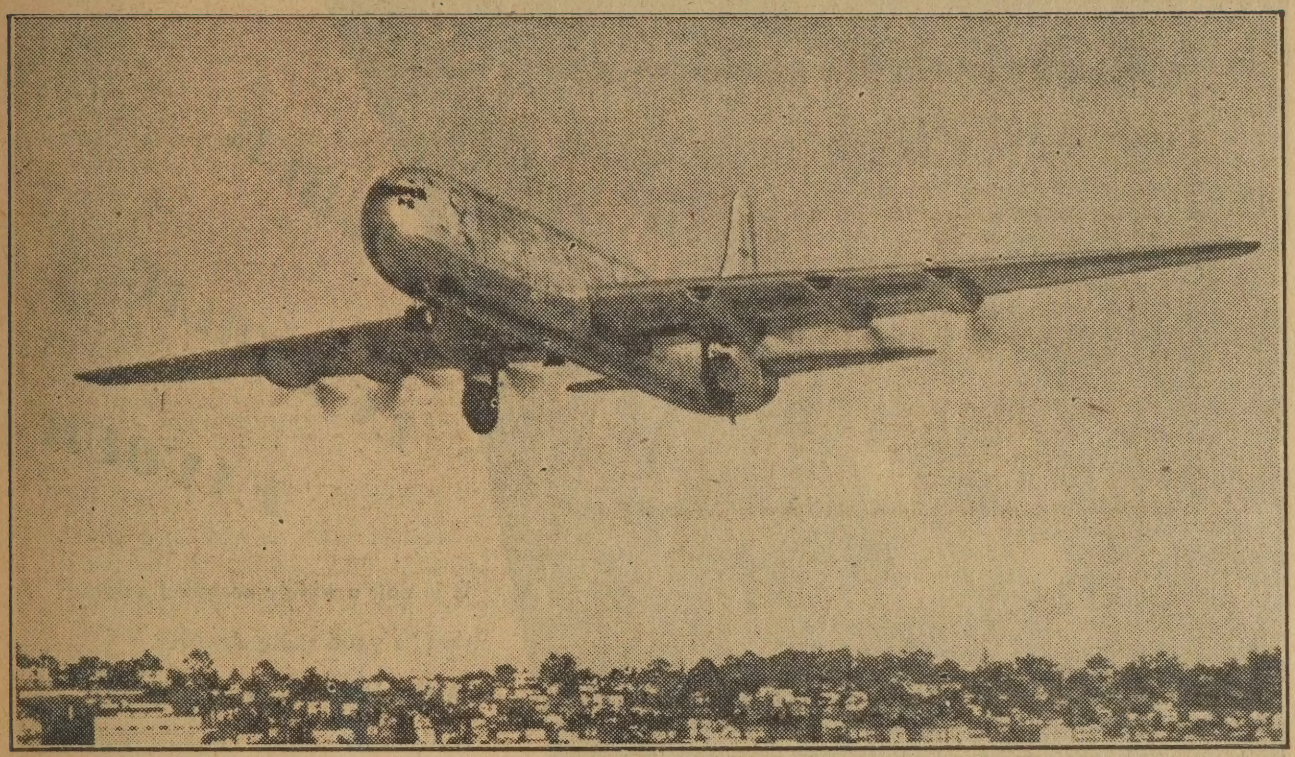
Rola 6K Speakers are now becoming available to and through the Trade

Rola

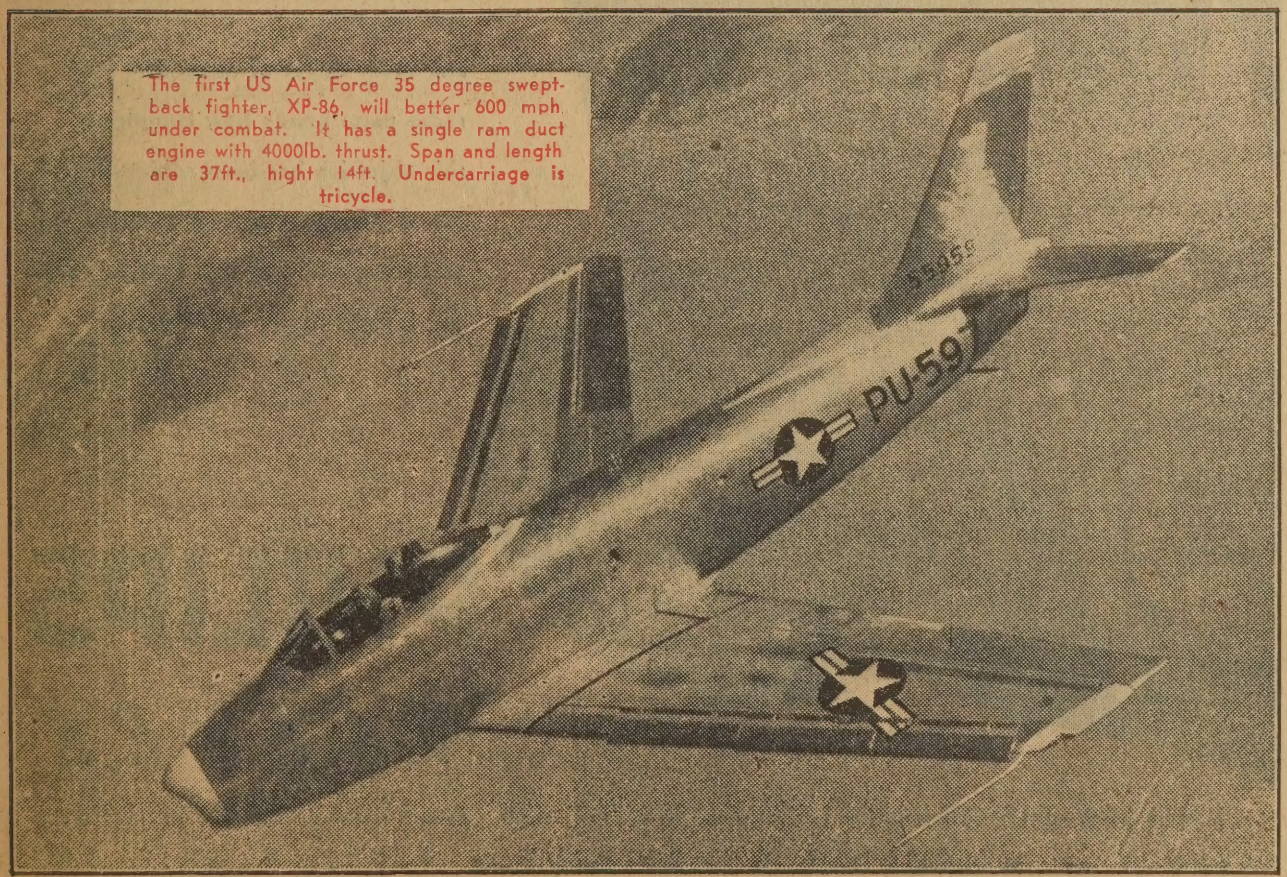
LOUD SPEAKERS WITH ANISOTROPIC ALNICO

Rola Co. (Aust.) Pty. Ltd., The Boulevard, Richmond, Vic. 116 Clarence St., Sydney, N.S.W.

TWO NEW AIRCRAFT SHOW THEIR PACES



Above is a picture of the Convair XC-99 six-engined, double decked sky giant on test, airborne at 115 mph. It uses airscrews mounted as "pushers."



The first US Air Force 35 degree swept-back fighter, XP-86, will better 600 mph under combat. It has a single ram duct engine with 4000lb. thrust. Span and length are 37ft., hight 14ft. Undercarriage is tricycle.

ROCKETING EVER HIGHER IN PUBLIC FAVOUR

It is now a widely accepted axiom that "a good radio *deserves* Philips Valves—and a so-so set really *needs* them." Philips Valves are designed and made to give *better listening for a longer time*—and every buyer of radio or radio parts knows how completely this objective has been achieved. No matter what type of receiver yours is, you'll find that Philips Valves put it right on top of its form.

PHILIPS

VALVES

PHILIPS ELECTRICAL INDUSTRIES OF AUSTRALIA PTY. LTD.

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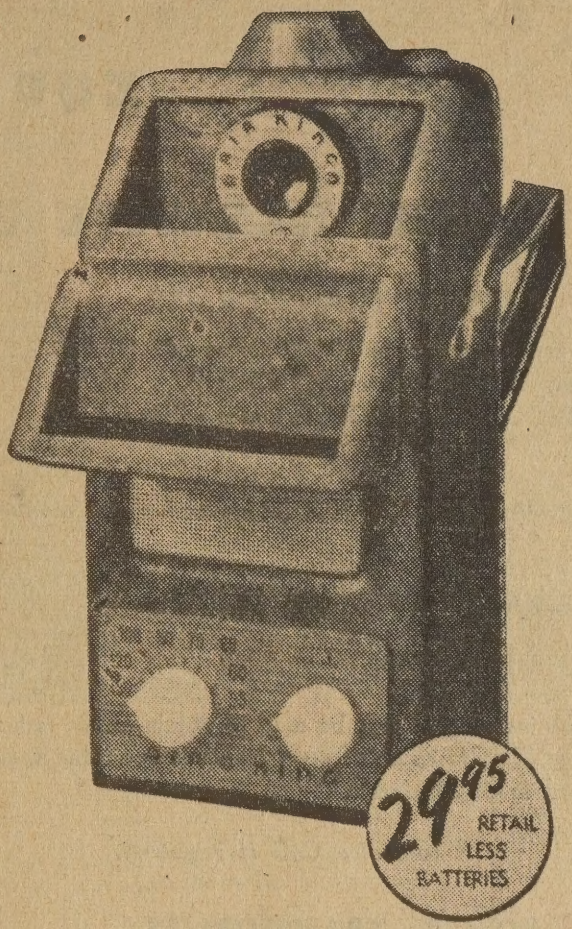
V8A-47

THE LATEST—CAMERA AND PORTABLE SET

IDEAL TWO-IN-ONE HOLIDAY COMPANION

Don't rush to your nearest radio dealer for this one, because you certainly won't be able to buy it! It's just the latest, and very smart idea of combining two most useful holiday accessories in a single, handy cabinet.



PERSONAL radio sets have been available in USA for a long time, and they are no longer a novelty. Moreover, their price is very much lower than in Australia.

The same no doubt applies to cameras, otherwise it would scarcely be possible to sell the whole job for 30 dollars, which is something like £9 of Australian money.

The set measures 9½ by 4⅞ by 3⅝ inches, and without batteries, weighs less than 4lb. The number of valves is not specified, the advertisement from which we obtained the information refers merely to a superhet. circuit with the standard miniature valves.

The camera, naturally, is something of a midget affair, using standard 8 mm. film and a 50 mm. lens. It will take either black-and-white or color pictures.

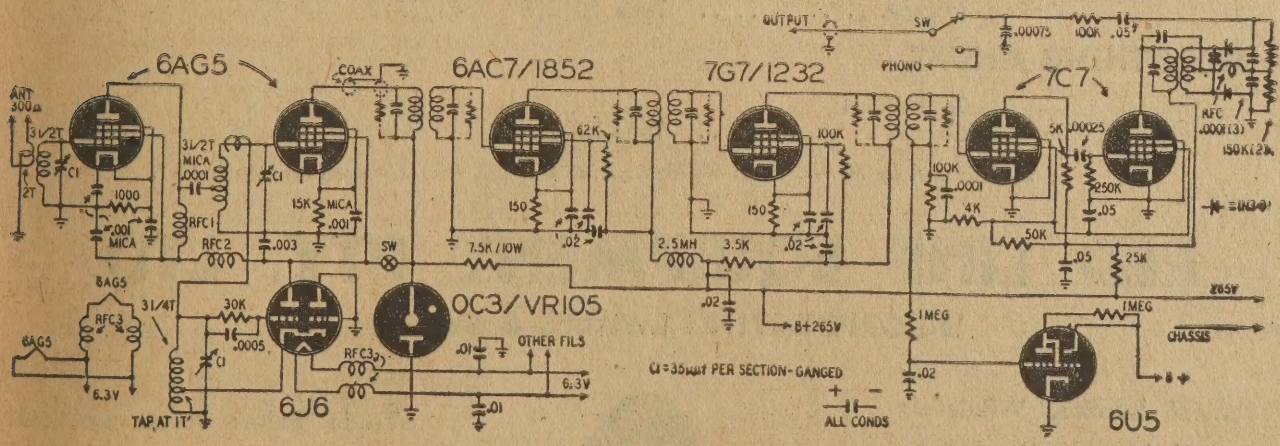
To our way of thinking, this little job has a terrific sales appeal, particularly in a country where out-of-door life is such a feature. Often on a short holiday or a hike, a choice would have to be made between a camera and a small radio, with the camera in all probability winning out for obvious reasons.

This combination allows the owner to have the convenience of them both, with little extra weight, and approximately the same space.

Quantity and therefore price would no doubt weigh very heavily against an Australian version of this receiver, but the idea should prove very tempting. And while about it, why not allow a small compartment in the base for the lady's lipstick and essential mirror?

A little imagination might well produce a holiday companion which one simply couldn't resist buying.

A HIGH PEFORMANCE F.M. CIRCUIT FROM U.S.A.



The circuit shown above, taken from a copy of "Radiocraft" is interesting as an indication of one approach to a tuner for the higher frequencies. High slope pentodes are used for R.F. and mixer stages, and a 6J6 is preferred as an oscillator to the 6C4 so often employed. Coils are ½ inch diameter but may be modified for other frequencies. RFC 1 and 2 are of 5 m.h. and RFC3 is 15 turns of 16 gauge close wound on ¼ inch dowel. The I.F. channel is 10.7 m.c. Incidentally, the 6J6 looks to be a highly important type on these frequencies mainly because of its high transconductance and extremely low noise level. For this reason many designers use it in the region of 100 m.c. (approximately the frequency of this tuner) both as a grounded-grid R.F. amplifier and a mixer. However, others still prefer the high-gain valves. The essential features of this circuit could well be employed by experimenters on both the 50 m.c. and 166 m.c. amateur bands.

RED LINE

EQUIPMENT

for

THE NEGATIVE FEEDBACK AMPLIFIER ★

OUTPUT TRANSFORMER

Primary Impedance 10,000 Ohms 807 (T) P.P.
Secondary Impedance 500 Ohms * 34 db.
FREQUENCY RESPONSE: Linear within 0.2 db.
20 cps. to 30,000 cps.

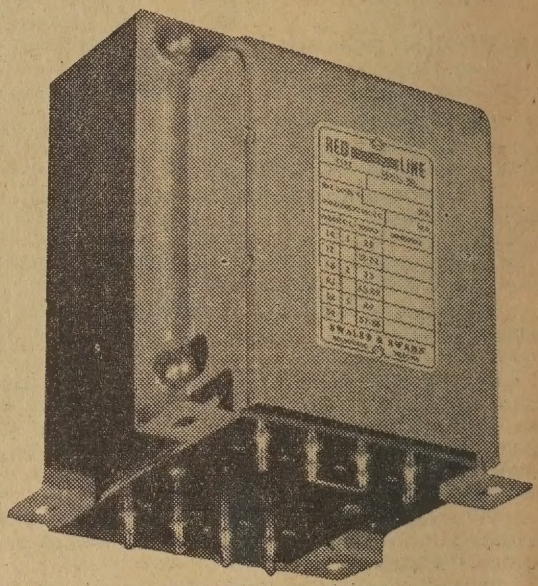
PRIMARY INDUCTANCE (at low ac flux) not less than 125 Henries.

LEAKAGE INDUCTANCE: 17 Millihenries.

INSERTION LOSS: 0.4 Decibels.

This transformer may be used to obtain a gain reduction of up to 25 db across 4 Stages in a suitable negative feedback circuit.*

** to Voice Coil if required.*



TYPE No. AF10
Weight 7lbs. Price: £6

POWER TRANSFORMER

10v, 210v, 230v, 250v, 50 cps. Sec. H.T. 500/500v at 175 ma.
5v 3a. 6.3v.; 2a 6.3v. 3a Type 17503 £3/12/6

FILTER CHOKE

12 Henries
175 mA .. .. Type 201515 £1/11/0

SMOOTHING CHOKE

25 Henries
60 mA .. .. Type 50825 £1/7/0

★ *as described by Mr. D. T. N. Williamson in "Wireless World," April and May, 1947.*

RED LINE EQUIPMENT PTY. LTD.

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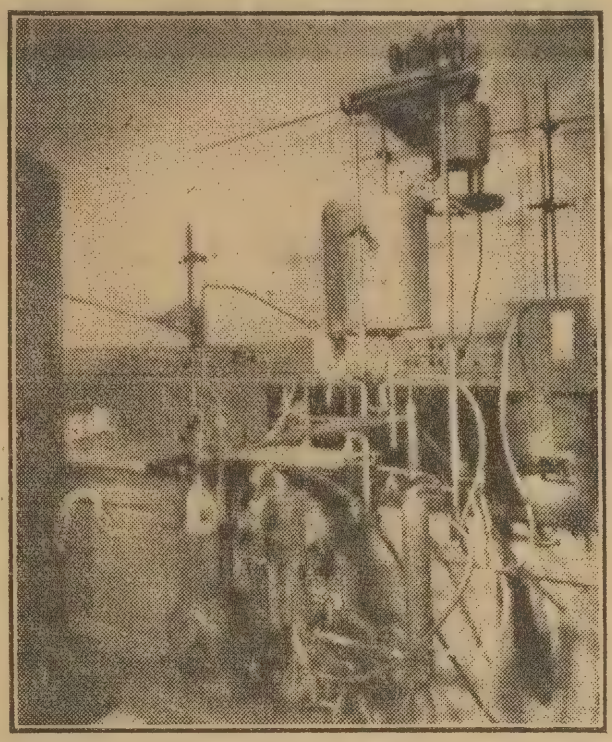
A GUARANTEE OF DEPENDABILITY

RADIO MAY PASTEURISE OUR MILK SUPPLY

EXPERIMENTS GIVE GOOD RESULTS IN LABORATORY

This new science of radiothermics, a direct outgrowth of research in high frequency broadcasting, first received notice when it provided a means of speeding production lines during the war by completing in minutes industrial operations that had required hours or even days. Since then it has proved valuable in hastening output and reducing costs in peacetime manufacturing processes.



Experimental Pasteurising system erected in RCA Laboratories during research on the electronic teatment of milk.

IN conventional pasteurisation of milk, the milk is normally heated to a temperature of 143 degrees F. and held at this temperature for 30 minutes. The milk is then cooled for storage or bottling with the bacteria content usually reduced to about 1 per cent of the starting value.

Dairymen explained that if times less than 30 minutes are used the bacteria content is notably greater, whereas a longer time results in a cooked flavor and an apparent reduction of cream volume.

Investigation was made of flash pasteurisation methods in which the milk is heated to 161 degrees F. and held for 16 seconds. In some of these experiments the milk is spread on a thin film of heated plates and then quickly pumped over cooling plates. In another process the milk is passed between two electrodes to which 60-cycle voltage is applied. Since the milk is a good conductor, current flows through the milk and generates heat.

It appears that difficulties with the electrodes have kept this latter method from becoming popular.

CURRENT THROUGH MILK

Seeking to learn the solution of fundamental problems connected with this procedure, a series of experiments were carried out. In the first of these, milk was pre-heated to 140 degrees F. and was then run through a long glass tube, ¼in. in diameter. Electrodes wrapped around the glass tube consisted of two pieces of copper foil, causing radio-frequency current to flow from one electrode through the glass to the milk stream and down the milk stream for a few inches. Temperature was measured by a thermocouple inserted below the second electrode.

These experiments showed that excellent pasteurisation could be obtained in about 67/1000 of a second though it was not possible to achieve temperatures above 190 degrees F.

The tendency above this temperature was to form steam pockets with uneven flow.

Study indicated that this tendency probably was due to non-uniform flow in the tube, wherein the milk stream adjacent to the glass was slowed down by friction and thus raised to a higher temperature than the centre of the stream.

In efforts to circumvent this effect, the tube was so arranged as to produce a free-falling stream between the electrodes. With this arrangement, the milk could be heated to 205 deg. F. without steaming or breaking.

Using the uniform flow arrangement, experiments were conducted in which bacteriological tests were found to be excellent. The pre-heating was accomplished by causing the milk to flow through tubing of pure tin which, in turn, was submerged in a tank of warm water. The milk then flowed through the electrodes and was cooled by passing over a set of fins through which ice water was pumped.

When samples of the milk pasteurised by this method were tasted, however, it was discovered that there was a definite cooked flavor whenever the milk had been heated to 190 degrees F. or higher.

COOLING TIME

It was decided that the cooling time of approximately five seconds apparently was too long. More rapid cooling was, however, achieved by injecting the milk stream into a vacuum chamber. The heating time was maintained at 67/1000 of a second but the cooling time by this method was reduced to 2/10 of a second. The milk was cooled to 135 degrees F. by means of the vacuum expansion then the milk was poured over cooling fins and reduced to 40 degrees F.

Samples for bacteriological tests were taken at the conclusion of the vacuum expansion, and cream volume samples were taken at the lower temperatures. Samples of milk which were tested showed no traces of cooked flavor at any temperature used. Even a sample taken at 205 degrees F. could not be differentiated from the raw milk.

Bacteria count was reduced to 100 as compared to 48,300 normally found in milk pasteurised by the conventional method at 143 degrees F. for 30 minutes. Bacillus coli was zero as compared to plus two in the conventional method.

STILL EXPERIMENTAL

Pasteurisation by radio heat is so new that many questions remain as to the exact effect of the method, but perhaps the most striking and promising fact of all is that milk so treated keeps longer than pasteurised milk which we drink today.

While ordinary pasteurisation kills most of the biological harmful bacteria found in milk, other non-harmful bacteria stay in the milk and cause it to sour. By eliminating these heat-resistant bacteria, progress has been made toward the development of a longer-keeping milk.

One of the chief limitations of the new process is that it can only be used to produce homogenised milk. However, with greater quantities of homogenised milk being sold today than ever before it is conceivable that its acceptance will be widespread in a few years.

Experiments worked out by RCA in co-operation with the Walker-Gordon Company and the Borden Company, large Eastern dairy products producers, provide for a continuous radiation treatment which promises a possible foreshortening of milk-processing operations. The experiments, however, have been limited to the laboratory and at the present time interest of milk producers is not deemed sufficient to warrant commercialisation of the system.

WANDERING JEWS OF THE UNIVERSE

This photograph of the comet de Kock was made available to us by the Sydney Observatory.

The recent appearance of a comet in our southern skies is an event which furnishes astronomers with an added interest and revives a public desire to learn a little about these strange visitors.

by Calvin Walters

UP to the time of writing this article the new comet has not been identified as one which has visited us before. Astronomers all over the world where the comet is visible are busy making calculations to find out whether it is a new comet or an old friend. At present it is called 1947N.

COMETS UNWELCOME

Comets were not always looked upon with favor. In ancient times the appearance of such a heavenly body usually indicated to the superstitious the advent of some disaster. This was no doubt due to the fact that if one took the trouble, one could always find some disaster happening at the time of the comet's appearance. The same kind of disasters were happening every day, but went unnoticed in the absence of any particular celestial omen.

In the year 1456, when a particularly bright comet appeared in the sky, Europe was particularly afraid of the Turks. This gave rise to a saying, "God save us from the devil, the Turk and the comet."

Nowadays we take such visitations as a matter of course, due, no doubt, to the advance of scientific knowledge, and the more precise information which we have gained from the use of the telescope.

Comets are not usually discovered by accident. In certain observatories all over the world, some observers are engaged almost wholly in scanning the heavens with telescopes in a very systematic manner. Not all comets are visible to the naked eye, and those that are not are called telescopic comets.

When a suspicious-looking object is detected, its position is fixed at once and reference is made to a catalogue of known nebulae. This is done as a preliminary, because it is sometimes impossible to distinguish at first between a telescopic comet and a nebula. If it is in a position where no known object is supposed to be, it is closely watched for evidence of motion which it must have if it is a comet. This motion is determined by carefully fixing its position in relation to several adjoining fixed stars.

DISCOVERY CLAIMS

Any slight alteration in its position settles the matter, and the information is transmitted to foreign observers, who, in addition to determining its path, immediately start an argument as to who found it first. Sometimes this argument is never settled in a satisfactory manner so, in order to overcome the difficulty, all comets are given a number.

That comets traverse the heavens in a definite orbit is now accepted. These orbits, however, vary somewhat and fall into three classes—the ellipse, the parabola and the hyperbola. These are illustrated in the diagram of the cone given here. The matter is made clear in another figure showing these orbits in relation to the sun.

When a comet revolves round the sun in an elliptical orbit it is said to be periodic, for it then returns in a fixed period of time according to the size of the ellipse over which it travels. At the point where it is nearest to the sun it is said to be in perihelion. Comets with an elliptical orbit really belong to our system just the same as a planet, and most comets have this type of orbit.

PERIODICAL COMETS

There are not many more than 100 of these periodical comets, of which the most famous and spectacular is Halley's, named after Edmund Halley, who carried out some interesting observations in 1682. This appears every 75 years, and was last seen in 1910. It will reappear in about 1986, so that most readers will probably have their bath-chairs wheeled out on to the verandah by their great-great-grandchild to have a look at it.

Halley's observations make interesting reading. When a large comet appeared in 1682, Halley made calculations based on what was known with the object of finding out whether any comets made periodical appearances. He proved that the large comets of 1531 and 1607 actually moved in the same orbit as that of 1682. This indicated that these were successive visitations of one and the same comet. Tracing further back he found records of a

COMETS ROAM THROUGH OUTER SPACE

comet of "unheard of brilliancy" in 1456, and again in 1380 and 1305. The latter was a comet of "terrific dimensions which made its appearance about the time of the Feast of the Passover which was followed by a great plague."

The year 1066 saw another comet which created universal dread in Europe. And so the records trace this comet back to the year 11 BC by a Mr. Hind, who has also found among ancient Chinese documents reference to what is believed to have been the same comet. Some observers claim to have traced it back to 166 BC.

HALLEY'S COMET

Halley, in 1682, prophesied its return in about 1758. This came true. It returned in 1835 but appeared to have been less brilliant. In 1910 it again appeared but it was less brilliant than before, which seems to indicate that something is happening to it. Perhaps its day is done, but if you will be patient and wait until 1986 you will find out for yourself.

In addition to Halley's comet the best-known periodic comets are Encke with a period of about 3½ years, Winnecke 5½ years, Brorsen 5½ years, D'Arrest 6.3 years, Biela 6.6 years and Faye 7½ years.

It is easy to see from the diagram how a comet with an eliptical orbit returns in periodical cycles. As it traverses the enormous path of the ellipse, it passes wide out into space, and returns in the opposite direction to move round the sun. At this point it is said to be in perihelion.

PARABOLIC ORBIT

On the other hand, the comet which traverses a parabolic orbit may never return to our view in our lifetime for, having appeared in perihelion, it flies out into space along the branches of an ellipse of indefinite length, which constitutes the parabola, and may never return to perihelion. No comet of this class can be called a periodic comet.

The comet which traverses the lines of a hyperbola is lost to us forever after passing round the sun once. A hyperbola has branches which are divergent, so that no comet can return along these branches, but is flung out into indefinite space never to return. Very few comets belong to this class.

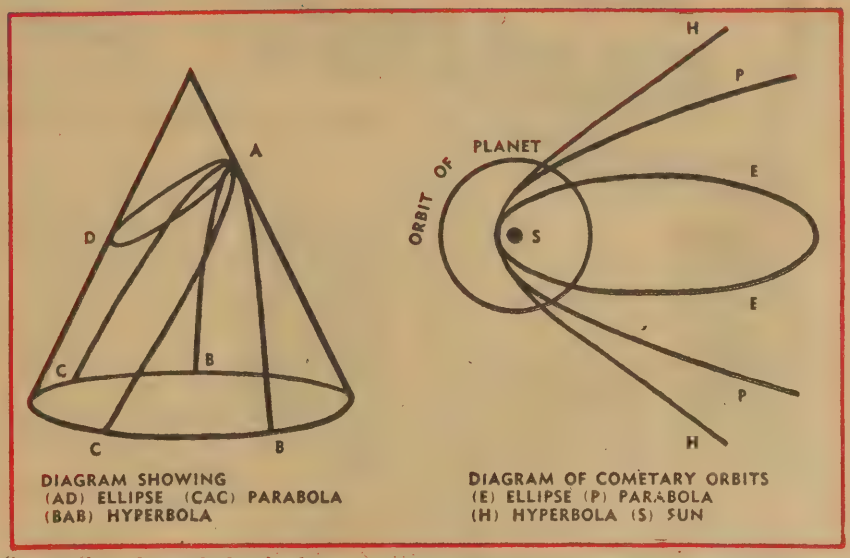


DIAGRAM SHOWING (AD) ELLIPSE (CAC) PARABOLA (BAB) HYPERBOLA

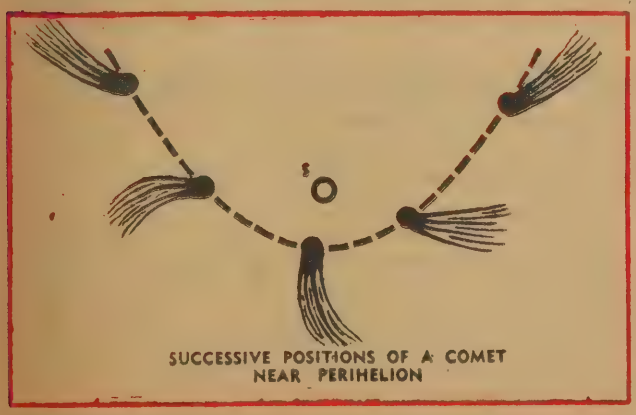
DIAGRAM OF COMETARY ORBITS (E) ELLIPSE (P) PARABOLA (H) HYPERBOLA (S) SUN

Any comet which does follow a hyperbolic orbit becomes visible to us only by accident, for it does not really belong to our system. Roving through space it occasionally comes within the influence of solar attraction. This makes itself felt very strongly as the comet is drawn towards the sun. It is then wheeled around the sun at tremendous speed and departs into space forever.

PERIODICITY

Although comparatively short periods of time exist between appearances of certain of the comets named, this period depends on a number of factors, chief of which is the size of the elliptical course. A comet of 1744 was supposed to have an orbit so vast that its period for return was calculated to be 122,683 years. We will all have lost interest in the subject long before that time has elapsed, so it is really immaterial whether the calculation was correct or not.

Although Halley's comet is perhaps the most spectacular of all, that of Biela is most interesting, for on its return in 1845, it was seen to divide into two parts, which returned again in 1852 following paralled orbits.



SUCCESSIVE POSITIONS OF A COMET NEAR PERIHELION

Since that time the comet appears to have disappeared from our solar system, for constant search during the calculated time of its return has failed to locate it. It would appear that this comet completely disintegrated, for a curious phenomenon appears every year on the night of November 27, or thereabouts. At this time shooting stars are seen in great numbers, and it is conjectured that as the earth at this time passes close to the orbit of Biela's comet, these shooting stars are the remains of the comet travelling along the original orbit.

ENCK'S COMET

The comet of Encke with an original period of 3.3 years, seems to be suffering from some influence which is slowly drawing it nearer the sun and shortening its periodic time. If nothing happens to stop it the comet must eventually fall into the sun. There appears in this case to be some resistance offered the comet in space, which the laws of gravity fail to explain. This resistance is constantly opposing the comet's velocity, thus allowing an intensification of the solar attraction so that the orbit of the comet is slowly closing in on the sun.

The actual composition of comets is still largely a matter of conjecture. As viewed through a telescope the comet consists of a central nucleus like a star surrounded by a glowing "coma" called a head. The tail of the comet may or may not be visible.

It is not certain whether the nucleus consists of solid matter. Some contend that this nucleus shines by its own light while others contend that it reflects the light of the sun. It seems that the whole comet consists of but a slight amount of material, for in some of the largest it has been observed that the

(Continued on Page 55)

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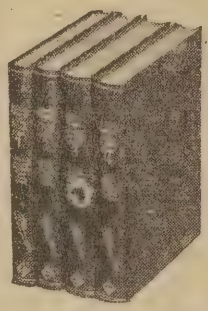

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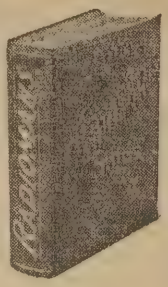

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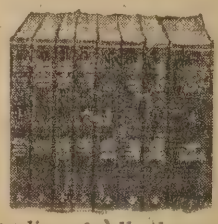

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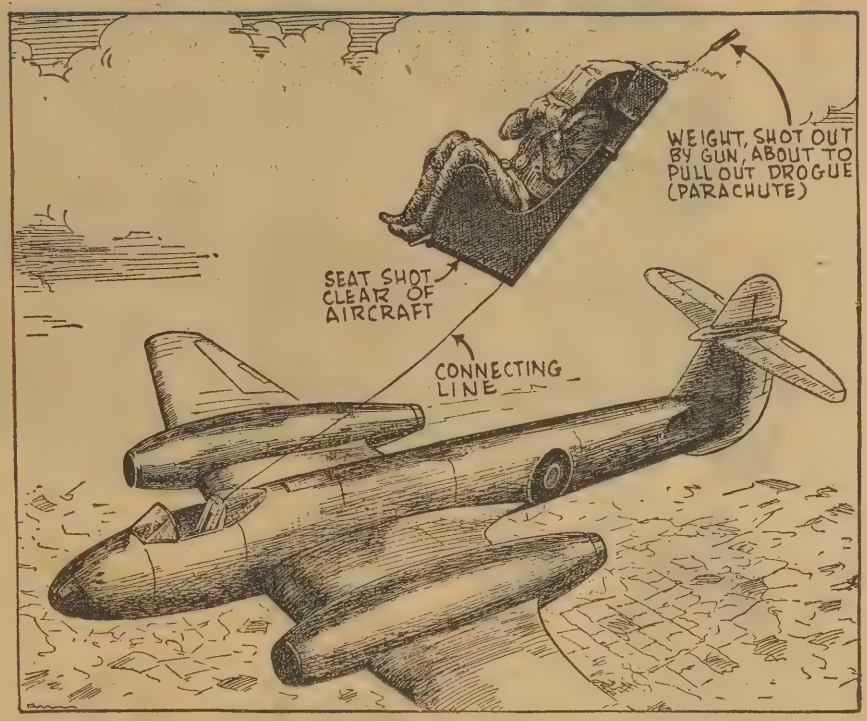
Tech. R&H 2/48

THE R.A.F.'S PILOT-EJECTION SEAT

Development of jet aircraft has called for the perfection of apparatus designed to enable pilots to escape from high speed planes, and special attention to the problem has been given by British experts.

A few months ago the first man to be ejected from an aircraft travelling at over 500 miles an hour made a safe descent from an RAF Gloster Meteor jet fighter.

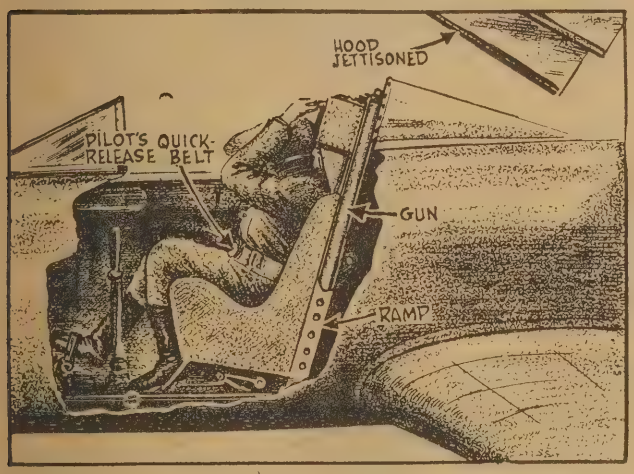


Above: Showing how the ejection seat operates—the pilot is automatically thrown clear, and parachuted to earth.

SKETCHED here is the apparatus used. It was invented by Martin-Baker Aircraft, and has now been adopted by the RAF.

The pilot-ejection seat is hurled clear of the aircraft by means of a piston-gun and two small explosive charges. The inner piston is attached to the seat, while the outer is fixed to the aircraft. The ramp on which the seat is hurled upward slopes back slightly from the perpendicular.

First the cockpit hood is jettisoned. The pilot then places his feet on the seat footrests and prepares himself for the rapid ejection.



Left: Pilot about to pull down the face shield which sets off the ejection cycle.

The first charge is fired when the pilot pulls down a face-shield blind. Because of the speed of the aircraft and the speed of the ejection, this is an essential feature for the protection of the pilot.

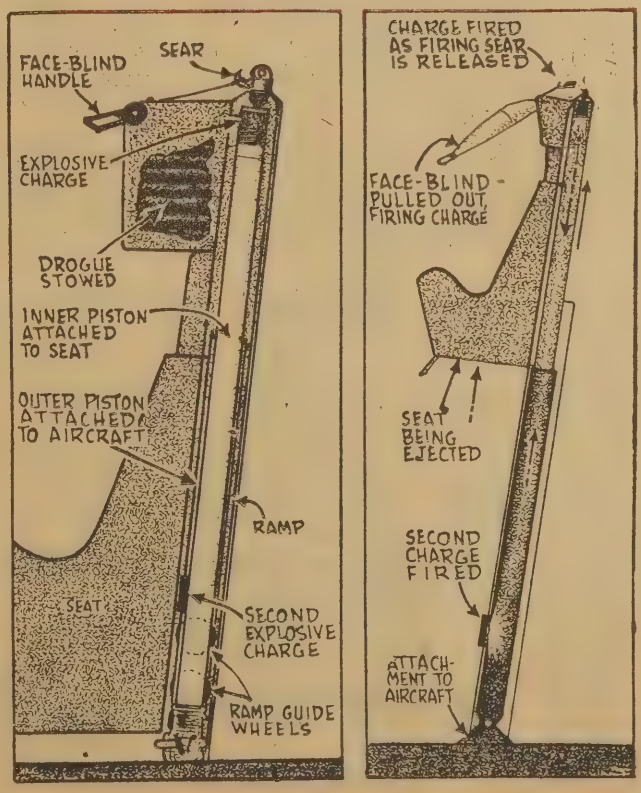
As the cylinders begin to move apart under the impact of the first explosion, a second charge (located in the wall of the outer cylinder) is fired.

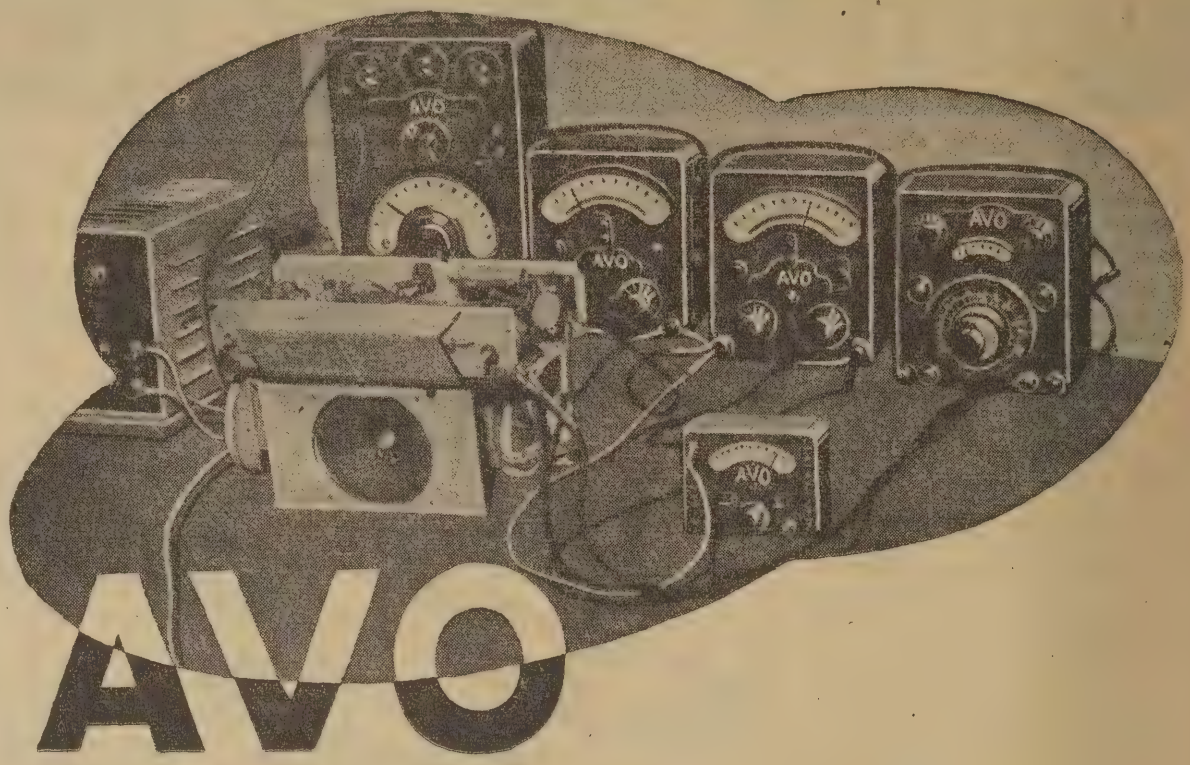
To prevent the pilot's seat turning over and over in midair, a small parachute or drogue is fitted into the headrest of the seat, and this is pulled out by a gun, which fires a tubular weight attached to it. This gun is fired by a connecting line attached to aircraft. This line is freed from the seat immediately it has fired the trigger and when the seat is well clear of the hurtling plane.

The pilot then falls forward out of the seat with his right hand on the release lever of his own parachute, while the seat drops rapidly.

After a free fall for a certain distance the pilot pulls the rip cord (or release lever) of his parachute and floats safely to earth.

Below: Details of the mechanism showing how explosive charges operate in the process of ejection.





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NEWS AND VIEWS OF THE MONTH

F.M. News

AT the time of writing, there is still very little to report concerning FM in Australia. The experimental transmissions being carried out by the PMG have yielded considerable information, and have provided engineers with valuable experience in this field. As far as set production is concerned, there is as yet nothing in sight, and no definite plans have been approved for providing regular programmes if they were made available.

Factory technicians in all the major firms have been carrying on their own experimental work with receivers, the largest of which could no doubt get something ready at comparatively short notice if required.

New Valves

LOOKING through information received from overseas, however, one notices that there is still much ground to be covered in technique before design settles down to anything like stability. New multiple valves have now been announced which although not involving radical changes in circuitry, will have a profound effect on construction, general design, and size. These valves will be fairly costly, and because of the dollar position, are not likely to become available here in any quantity for some time to come.

It does not appear to be much encouragement to local manufacturers to produce sets using standard valves, knowing that their designs could be greatly improved upon, and probably reduced in cost, when the components become available to follow out the latest ideas. Local valve companies have their hands full at present in the production of standard replacement valves, and are not likely to consider "tooling up" for new types, particularly those which may call for new methods and machinery.

Your New Set

During the next 12 months, many things are likely to happen which will affect all the abovementioned points, and it is not inconceivable that FM sets of some kind might make their appearance before the end of 1948. This is only a guess, however, which depends on many factors at present unknown. Your new receiver can still be a standard AM type, and it is bound to have its full usefulness for many years ahead.

V.H.F. Ranges

OUR own experiments on 50 megacycles have shown that with a transmitter of comparatively modest power, signals may be received at points up to about 200 miles at varying but often good strength. Conditions for such reception do not depend on the "Sporadic-E" layer conditions which have so sensationally appeared on this band during the last few months, and which have allowed New Zealand stations to be heard at full strength. It appears to be due to temperature inversion, air-mass bending, or anomalous propogation, whichever you prefer, which is a function of meteorology rather than anything else.

Although it is doubtful whether this type of reception will be dependable enough for a regular service, it does indicate the care which must be taken over allocation for service on the higher frequencies.

RADIO CROSSWORD PUZZLE NO. 6

ACROSS

1. Visual reed indicators.
9. Deduced.
10. Pedestal.
11. Type of waves.
12. Radio-active substance.
13. . . . . bridge.
15. Kind of pencil.
18. Headphone rubber ring (two words).
20. Two-element tube.
22. Disgrace.
23. Native of Italy.
24. Sound record disc (two words).

DOWN

2. Ground connection.
3. Type of resonance.
4. . . . . frequency.
5. Type of transformer.
6. Change A.C. to D.C.
7. Important in minimum capacity (two words).
8. Directional aerial (two words).
14. Keeps your set OK.
16. Angles.
17. Confirm.
19. These waves are short.
21. Rectifier type.

BELOW: LAST MONTH'S SOLUTION

	S	P	A	C	I	N	G	W	A	V	E	
T		L		R						E		S
H	E	A	T	E	R	S		M	O	R	S	E
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M				S		P				E		C
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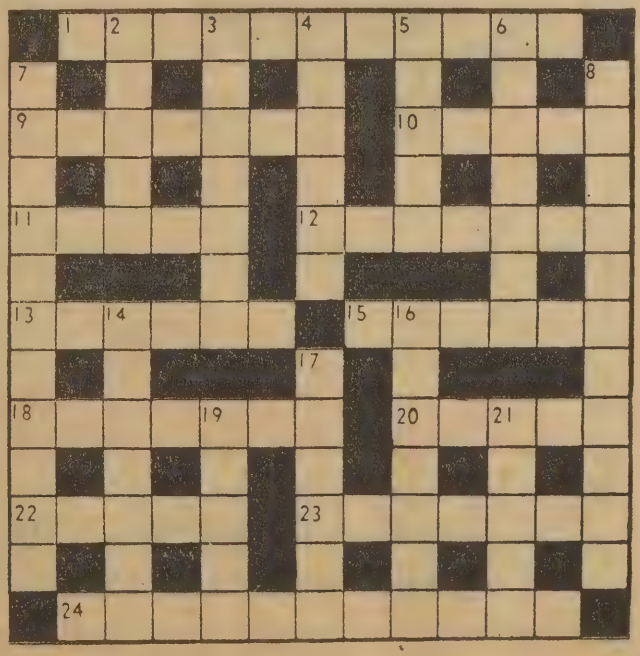

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The Kingsley range is amazingly wide—nearly 30 different types of I.F. transformers—455 K.C., 175 K.C, and 1.9 M.C.—over 30 types of broadcast coils including a series for CAR RADIO—10 types of Short Wave coils—all these components having been designed by Kingsley's research engineers to perform their various functions. The new range of miniature I.F. Transformers, aerial R.F. and Oscillator coils set a new standard and are used in that amazing performer the Kingsley "Walkie-Talkie," Personal Portable Foundation Kit.

SPEAKERS

Kingsley Speakers now readily available are the well known 6 inch permag. (type KR6) and the miniature 3 inch permag. (type KR3). Radio Engineers have been unstinting in their praise of these splendid reproducers—each one an item of high-precision production.
Kingsley is developing the remainder of their speaker range—the next will be the 5 inch permag. (type KR5) which will be available before long: Watch for announcement of its release. Later, a high quality large type will be produced.

COILS

Incorporating the Kingsley iron-core technique, the range of "Permacore" and "Permaclad" broadcast, short wave and car radio coils enjoy an unrivalled reputation for efficiency, uniformity of performance and long life. There is a coil to suit your purpose—455 K.C.—175 K.C.—1.9 M.C. for use with "F" or "H" gang condensers.

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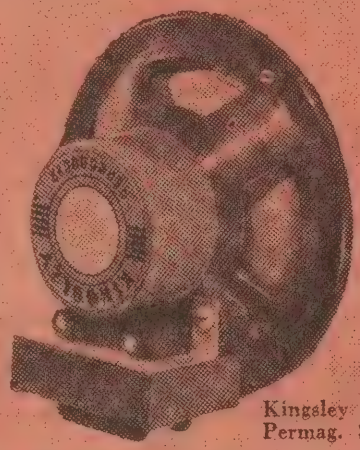
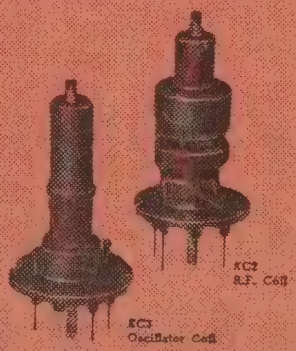


Kingsley 3" Permag. Speaker



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The days when the optical theory of propogation was considered to be the whole story have long gone. It is highly probable that the higher the frequency, the more often will signals appear at long distances from time to time. As FM transmissions, for instance, will probably be located in the vicinity of 100mc., it is logical to assume they will go further, more often, than our experimental 50mc. signals, particularly as the power used will be up to 50 times as great.

It is a good thing to see so many of our technicians becoming more and more VHF minded. In this period of experiment, they have a golden opportunity to learn the new techniques they will be required to use. Experiences they may gain now in their own laboratories will be vital when finally action is possible.
geicov

These V.F.O's.

IT is particularly unfortunate that so many amateurs are abusing what should be one of the most useful and valuable aids to operation, the variable frequency oscillator.

At the rate things are going it is not inconceivable that the VFO will eventually find itself outlawed by the powers that be.

Recently we were waiting for a rather good DX station to sign on 14 mc. before calling him. The last syllables had scarcely left his mouth before an interstate station was after him on the same frequency, hammer and tongs. That was right enough, if only three other stations hadn't decided to do the same thing.

The result of all this was that the DX station came back to someone else. As if that wasn't bad enough, one of the locals decided to stay on the DX frequency and the last we heard of our distant friend was a bitter complaint to the other end of his contact that he would have to shift somewhere else because of QRM.

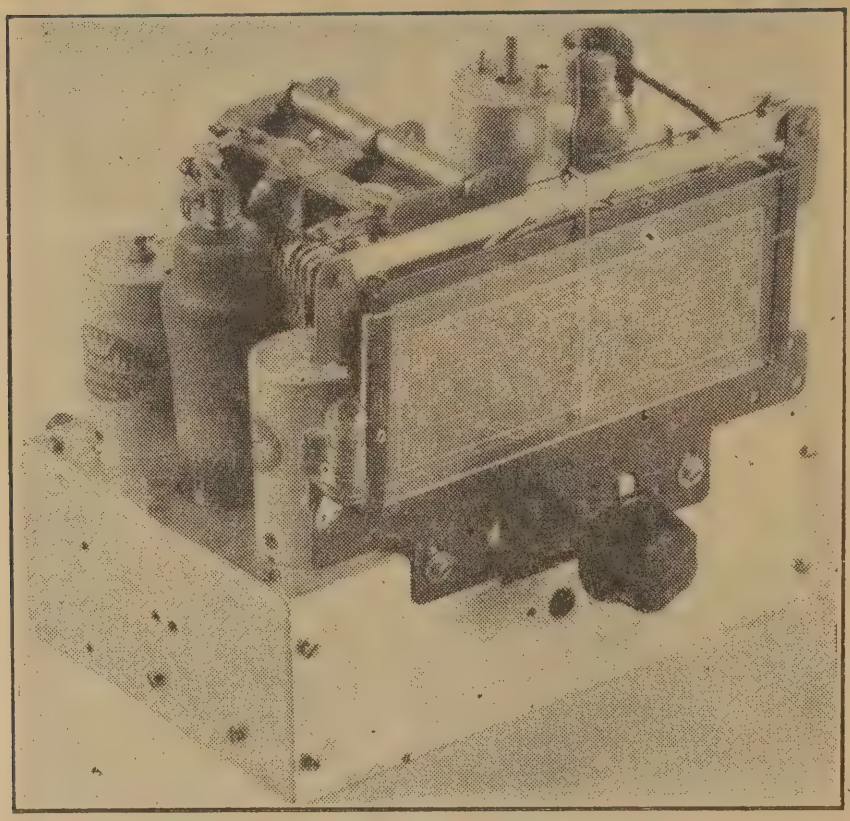
We are not suggesting there was anything against the rules in the above procedure. Any amateur is perfectly at liberty to use any frequency within the bands. But it does demonstrate the futility of trying to maintain a balanced occupancy when fellows make a habit of swooping all over the place.

We may easily find oursevles back where we started, with the practice of not listening on one's frequency being the only way to make sure of hearing a call. By staying in one spot, at least those who hear us will always know where we are.

In the meantime, one more plea for the utmost discretion in the use of VFO's. Don't let them trick you into bad habits.

The material known as corduroy is derived from the French "cord-du-roi," and according to history, the cloth, first woven from silk, was invented by a tailor to the French court. It was used exclusively for the hunting-clothes of the Kings of France.

A REMOTE-CONTROL TUNING UNIT



The unit is compact, and may be housed in a small cabinet to give "remote control" for your amplifier.

For the cost of a few pounds it is possible to build up a tuner, which will add greatly to the value of your pet amplifier system. The two-valve unit here described is essentially the "front end" of a superhet receiver. It is an excellent compromise between the various factors of cost, complexity and performance.

IN selecting a tuner circuit, one has the same basic problems as for a complete receiver. Unless one resorts to complicated and sometimes dubious circuit arrangements, it is not possible to have at the same time high selectivity and wide-band reception. One may attach great importance to either attribute or, alternatively, seek to strike a compromise between them.

NO R.F. STAGE

An RF stage is desirable for long-distance reception, but, if one never intends listening to other than the local stations, the stage is virtually a non-paying passenger. The same remarks apply to the inclusion of a dual-wave unit; it is very nice if one is interested in listening to the short-waves, but a pointless expense if the switch is permanently left in the broadcast position.

Of course, the fact that one has an amplifier is indication in itself that there is an interest in quality reproduction, whether it be from records or broadcast programmes. Some listeners go so far as to build tuners only selective enough to bring in a couple of the favored local stations and no others. But something more versatile than this is needed in the average household. Furthermore, tuners of this type are not satisfactory in all locations.

Obviously, then, there can be no one circuit which is likely to meet all requirements and, by the same token, there is room for a variety of tuner designs.

USING THE TUNER

The two-valve superhet tuner described this month is a perfectly standard arrangement, which is essentially the same as the tuner fitted to an ordinary 4/5 valve superhet. It will bring you a good selection of stations, is not expensive to construct, and will allow pleasing reproduction to be obtained. It can be built to our specifications from all new parts or put together in another form from parts which may happen to be available.

When we constructed the short-wave converter last month, we envisaged building up a simple tuner on the same chassis—or a similar one—and mention was made of that possibility. One reason for this idea was to simplify the provision of a suitable cabinet for either unit.

If a short-wave converter or a tuner is to be installed in the living-room, it has either to be fitted in the main cabinet or in a small one to satisfy the lady of the house. To make things easier for the trade in general, it is obviously easier to arrange matters so that a single cabinet will serve both purposes. Of course, for small gadgets of this nature many handymen prefer to make their own arrangements, and the demand for a special cabinet may not be sufficient to warrant large-scale production.

by W. N. Williams

When we came to fitting a two-valve tuner on to the original converter chassis, it was obvious that certain changes would have to be made, and these are evident from the photographs. The converter valve now mounts centrally alongside the gang condenser, with the aerial coil behind it and the oscillator coil in front. The two IF transformers are mounted symmetrically at the other end of the chassis with the IF amplifier and detector valve between them.

This layout makes it necessary for the terminals to mount on the rear of the chassis, the aerial and earth terminals near the aerial coil, and the audio output terminals behind the IF channel.

CHASSIS

Since there is only the dial control to arrange for, the spindle can be left in the central position, instead of being set to one side, as in the short-wave converter. The gang condenser occupies the same position in both cases.

The chassis you will ultimately buy from the shops will be punched to meet both requirements, which means that there will normally be two control holes unused in the tuner. But these will be handy if special considerations make it desirable to have a volume control on the tuner chassis.

When building the converter, the terminals will be on the rear of the chassis, instead of on top, the converter valve will be rather more forward, and there will be a few holes not required.

Referring to the circuit diagram, we elected to follow the usual plan of having a converter valve followed by a combined I F amplifier and detector stage. With this scheme, only two valves are required to convert the signal to an audio voltage, suitable for direct application to the input terminals of an ordinary amplifier.

First choice for the converter is the ECH35 or ECH33, which differ only in heater current rating, and are in fairly good supply. It does not matter which type you buy, as they can be regarded as interchangeable in this service.

However, there is no reason why one of the other standard converter valves should not be used if it happens to be on hand.

CONVERTER VALVES

For the 6A8-G converter, or the equivalent 2A7 and 6A7, the oscillator anode feed resistor will need to be reduced to 20,000 ohms. The screen current is much the same as for the ECH35, so that the screen resistor remains unchanged.

The same screen resistor will serve for the 6J8-G and this valve also requires a reduction in oscillator anode resistor from 40,000 to 20,000 ohms. The screen current of the 6K8-G is much higher than any of the other types, necessitating a reduction in the screen supply resistor to 20,000 ohms (2 watt), while the oscillator anode resistor will remain at 40,000 ohms.

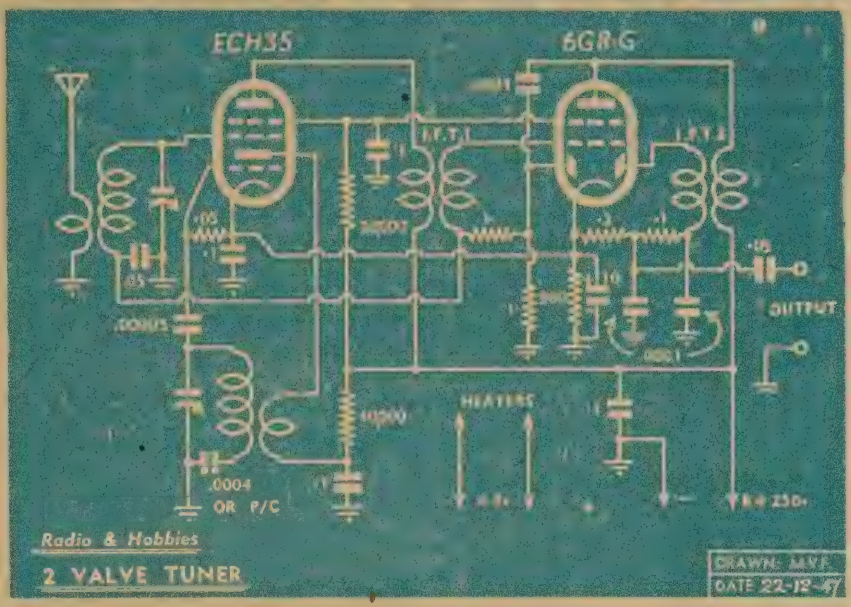
The only other likely converter, type EK2-G requires yet another set of operating conditions. Instal a .05 meg resistor between the B-plus and screen of the 6G8-G with a .05 meg resistor from the 6G8-G to the EK2-G screen and bypass both screens to earth with 0.1 mfd condensers. The oscillator anode supply resistor will be 30,000 ohms.

First choice for the I.F. amplifier stage is the 6G8-G, which has enough gain for the purpose, and is in fairly good supply. The pentode serves as a straight I.F. amplifier, the signal being fed to one diode for detection and to the other for A.V.C. purposes.

NOT A REFLEX

One may mention, in passing, that this often-used circuit is not a reflex arrangement, even though the signal appears to double back on itself. The point is that the diodes are contained in the same envelope as the I.F. amplifier tube instead of being in with the audio voltage amplifier. Either way, the circuit operates the same, individual designs favoring one method or the other as a matter of minor convenience. We like to keep the audio amplifier complete, a distinct circuit unit, so that the diodes are preferred in the I.F. amplifier valve.

CIRCUIT OF TUNING UNIT



The circuit is really the front end of a radio receiver. Power is taken from the amplifier.

The I.F. amplifier needs to be a variable-mu type, so that the 6B8-G is not a good choice for this stage, even though the valve is a diode-variable-mu pentode. Alternatives to the 6G8-G are the older 7-pin 6B7S or the continental EBF2-G (or EBF32). This type requires different socket wiring, but no change to the electrical circuit. The gain is higher, so that there is naturally a greater tendency to instability.

THE COILS

The choice of coils and I.F. transformers will have a large bearing on the ultimate performance of the tuner. If you want all the gain and selectivity of which the circuit is capable, buy the best coils and I.F. transformers you can find and align the unit accurately with modulated oscillator and output meter.

Older and poorer I.F. transformers, particularly, will give a less impressive station-to-station performance but may have a better high frequency response, due to poorer selectivity.

As a matter of fact, some interesting experiments can be carried out to reduce the selectivity of the tuner, if it is judged to be too sharp and to give inadequate high frequency response. The selectivity can be reduced—with accompanying loss of gain—by shunting the windings of the first I.F. transformer with resistors of about 0.1 megohm. Simply wire them between the "B" and "P" terminals, and between "G" and "AVC." In fact, you can try shunting the second I.F. transformer also with resistors of this value, or lower, and judge the net effect on quality.

But base your judgments preferably on a direct orchestral transmission, as some programmes have no upper register worth speaking of to notice or to miss.

PARTS LIST

1 Chassis 7½" x 5" x 2½"
1 Dial
1 2-Gang Condenser
2 Trimmer Condensers
1 Aerial Coil
1 Oscillator Coil
2 I.F. Transformers 455 kcs.

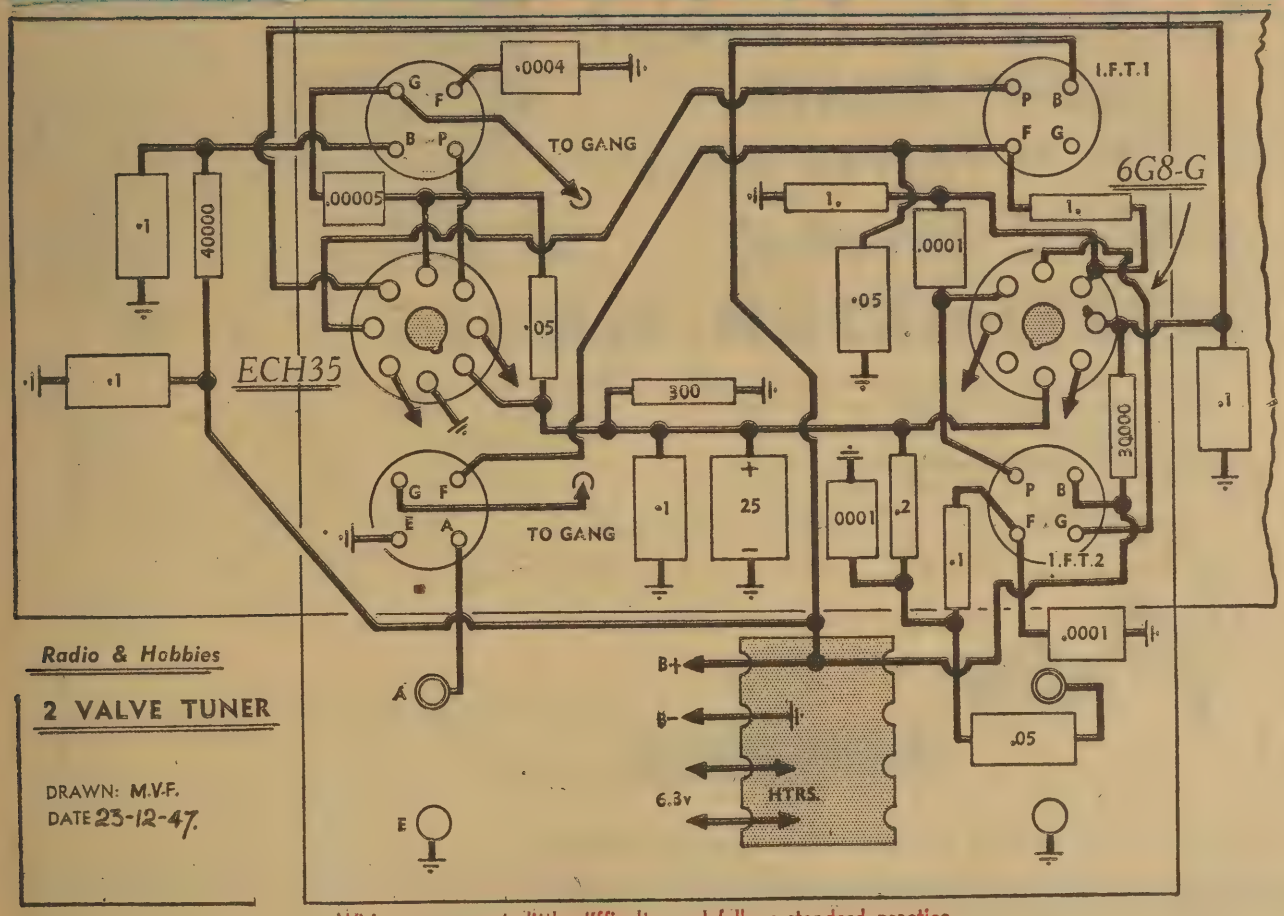
RESISTORS.
2 1.0 meg.
1 0.2 meg.
1 0.1 meg.
1 0.05 meg.
1 40,000 ohm.
1 30,000 ohm.
1 300 ohm.

CONDENSERS.
1 10 mfd. elect. 40 PV
4 0.1 mfd. paper
2 0.05 mfd. paper
3 0.0001 mica
1 0.0004 mica
1 0.00005 mica

VALVES.
1 ECH35, 1 6G8-G

SUNDRIES
Hook-up wire, spaghetti, mounting strips, solder lugs, 4 terminals, grid caps, 2 octal sockets, knob, shield can nuts and bolts, etc.

WIRING DIAGRAM FOR THE NEW TUNING UNIT



Wiring up presents little difficulty, and follows standard practice.

For operation, the converter requires 6.3 volts at about 0.5 amp for the heaters and 250 volts at about 15 milliamps, under typical conditions, for the high tension supply. In most cases this can be drawn without complication from the power supply of the amplifier. If the amplifier power supply will not handle the additional load, there would be nothing for it but to provide a separate supply for the tuner, using preferably one of the new miniature power transformers recently made available for our "Minivox" receiver. On the other hand, some compensation for the additional drain can often be made by increasing slightly the bias on the amplifier output stage or disconnecting any bleed resistor which may be included in the amplifier circuit.

POWER SUPPLY

Simply run four leads from the tuner to the main amplifier chassis, two for the heater supply, and two for the high tension. It is wise to avoid having any connection between the heater circuit and the chassis of the tuner, as the heaters will normally be earthed to the main amplifier chassis, and a second connection may result in a short circuit.

The audio load from the output of the tuner to the input terminals of the amplifier can be the subject of some experiment. Broadly speaking, it should be no longer than necessary for your particular requirements. However, some listeners like to have a tuner of this type as a more or less portable gadget which leads to the main amplifier long enough to allow the tuner to be operated from various positions in the room. There will inevitably be some voltage drop in the heater circuit, but it is surprising what one can get away with in this regard. The new parallel plastic flex suggests itself as an excellent medium for interconnecting tuner and amplifier.

POSSIBLE HUM

You may find that this flex or twisted leads are sufficient for the audio connection, although in some cases problems may arise from instability and hum. Where such trouble is encountered there is nothing for it but to use ordinary shielded lead for the audio connection, earthing the outer braid and using the inner conductor for the "hot" lead.

If it is desired to incorporate a volume control in the tuner, the 0.2 meg diode resistor should be replaced by a 0.25 meg potentiometer, the output being taken from the moving arm. The value of the diode load is deliberately lower than usual, the idea being to minimise shunting effects and also possible troubles with hum, instability and high note loss due to a long connecting lead.

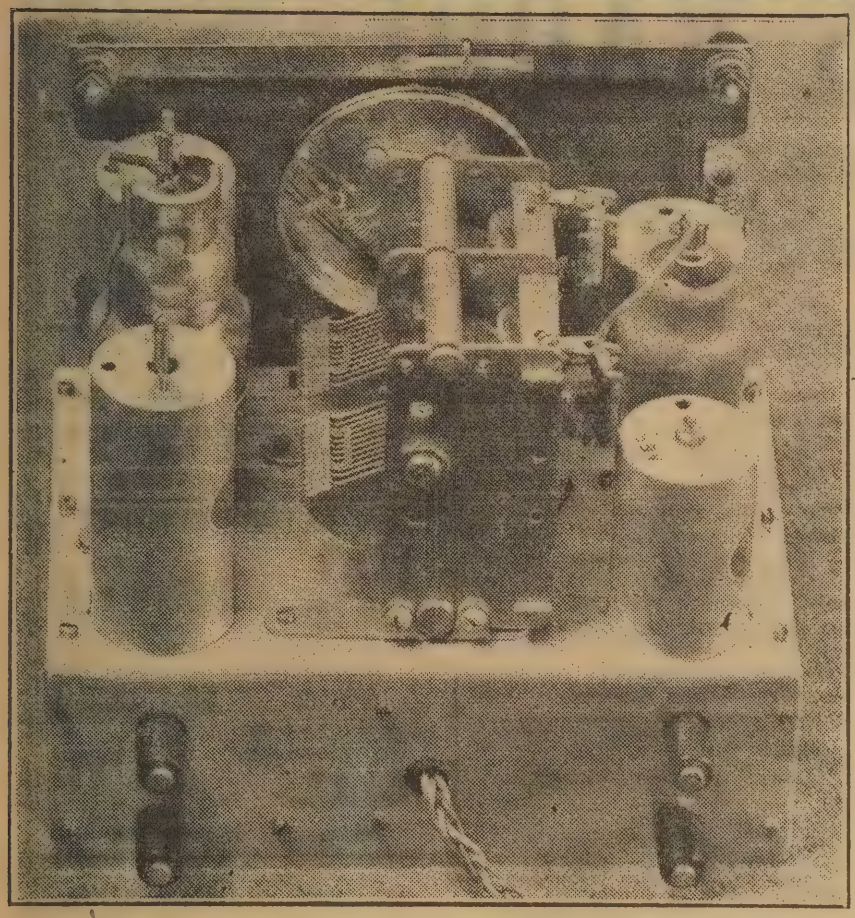
The general assembly and wiring of the tuner should be clear enough from the photographs and wiring diagram, and special comment is called for on only one point. In order to achieve a simple and balanced chassis layout it was necessary to have a long plate lead to the converter valve. To avoid instability troubles this lead should be run by as direct a route as possible and kept down close to the chassis. Mount the AVC bypass condenser near the first IF transformer, and in such a way that it shields the plate lead from the IF amplifier valve socket. This simple dodge will make all the difference between the tuner which is stable or unstable.

ALIGNMENT

The alignment procedure is exactly the same as for a 4/5 valve superhet. If you have an oscillator on hand, set the IF transformers to 455kc, but if no oscillator is available, leave them alone for the time being.

Tune in a weak signal at the high frequency end of the band and ad-

A REAR VIEW OF THE CHASSIS



Above-chassis components may be identified from this rear view.

just the trimmer on the aerial section of the gang for maximum signal strength. Then tune in a signal at the low frequency end and vary the core setting of the aerial coil for maximum signal strength, if your coils have this adjustment. Otherwise you will have to use a variable padder, which will need to be adjusted as the dial is rocked across the low frequency signal until maximum strength is obtained.

Set the dial pointer to register correctly at the low frequency end, then tune in a station at the high frequency end of the band and bring it into the correct position by adjustment of the oscillator trimmer. Peak the aerial trimmer again for maximum signal strength.

If the IF transformers have not been aligned already, carefully vary the settings of the cores or trimmers for the loudest signal. Repeat the whole procedure as a check on previous adjustments, and your tuner is then ready for use.

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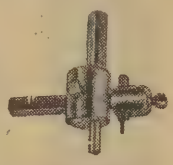

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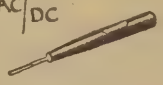

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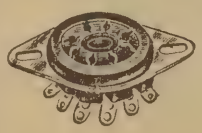

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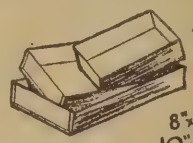

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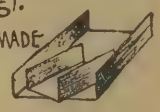

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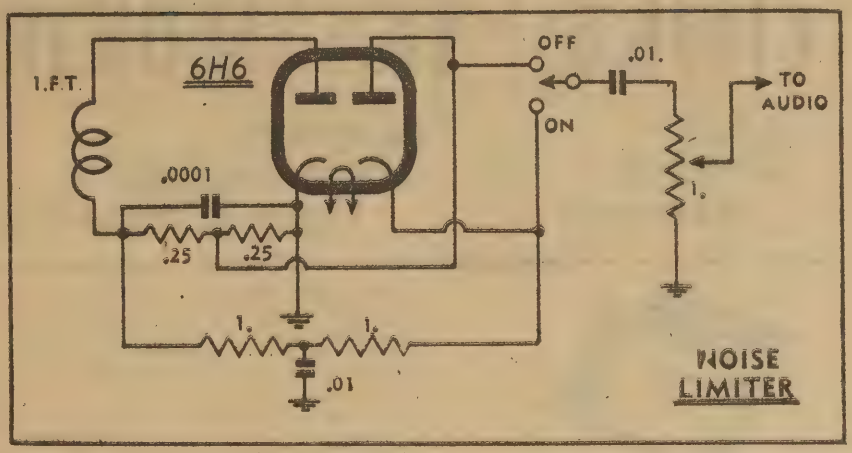

The circuit is extremely simple, and is particularly effective on receivers with medium selectivity such as normally used on U.H.F. bands.

REFERRING to the circuit, it will be seen that one half of the 6H6 is used in the normal manner for detection, the diode load being made up of two .25 meg. resistors in series, and the audio being taken from the junction of the two.

When the noise limiter is switched in, this signal reaches the audio through the second diode section, which is connected in opposition to the first, as far as polarity is concerned.

Under these conditions, the second diode will pass signals as long as its cathode is maintained at a potential more negative than its plate. If we assume the full voltage developed across the diode load at one instant to be 20, then the d.c. voltage from the split diode load will be 10, and the standing bias applied to the limiter diode cathode will be approximately 10 volts.

The two 1 meg. resistors and the .01 condenser are there merely as an audio filter to ensure that no signals reach the limiter cathode, while allowing the d.c. to be utilised in a manner similar to an A.V.C. circuit.

It is obvious, therefore, that any signals or noise in excess of 10 volts will not pass through the limiter diode.

Peaks of noise will quite easily reach values considerably higher than this, but are not passed through to the audio system.

This 2-1 ratio of voltages, however, will allow modulation up to approximately 100 per cent. to be accommodated, although in practice the percentage will be somewhat lower than this. Slight distortion of modulation peaks will be observed, therefore, but not sufficient to spoil intelligibility.

The fact that the limiter standing bias is automatically obtained from the detector diode load means that the limiting action is approximately the same, irrespective of signal strength.

The efficiency of the system is so good that it is possible to read signals quite well even with an electric drill in operation a couple of feet away from the aerial lead.

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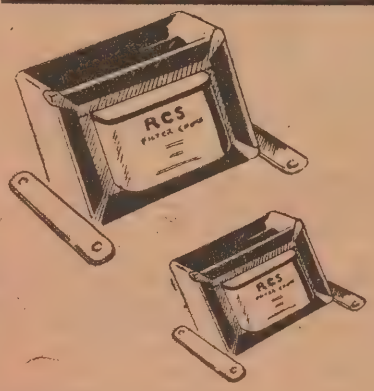

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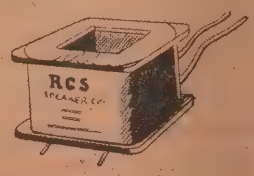

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MORE ABOUT Home Recording

Concluding his series of articles on recording technique, the writer has some helpful remarks to make about microphones and their characteristics. He discusses also matters of studio layout and technique, cueing, monitor and talk-back systems, all of which are essential to the success of a commercial studio setup.

CONCLUSION

THE rest of the amplifier (the 807 output stage has not been shown) is conventional, using push-pull triode drivers to the 807's, which run without grid current.

The use of an output stage with such a high peak-power-output capacity may be queried, but to achieve reproduction free from perceptible harmonic distortion and intermodulation, it is generally acknowledged that the average level should be about 15 db. or so *below* the peak power capability of the amplifier.

RESISTIVE LOADING

But there is another aspect. By using an amplifier, which will give more power than the head requires, we can afford to put a heavy resistive loading on the output transformer, to consume, say, 75 per cent. of the total power. This means that the output stage works into a substantially resistive load, and the arrangement carries with it many advantages of inverse feedback—without having to apply it.

Normally, the cutting head impedance undergoes violent excursions as the frequency varies, which would be serious if the cutting head were the sole load on the output stage. But where it is only a fraction of the load, the net load is virtually constant, irrespective of the instantaneous impedance of the head under dynamic conditions. It is thus not difficult to understand why American manufacturers of recording equipment turn out amplifiers with push-pull-parallel 807's, and push-pull-parallel 2A3's, to serve a head which overloads at less than 1 watt.

AMPLIFIER POINTS

To describe the construction of the amplifier would be too much to attempt here, but a few points about the general design are necessary. The pre-amplifier heaters should be run off DC for minimum hum. Although the heaters can be run off AC without an aggressive hum level, due to heater-leakage, the use of AC wiring so close to the input transformers is a dubious feature.

It is relatively simple to instal a small transformer giving about 13 volts at about 0.5 ampere. Then two 6.3 heaters can be supplied in series, from a small dry rectifier with 2000 mfd. or so across the DC terminals. The power supply unit can be at least six feet away from the main amplifier without troublesome voltage drop in the low-tension circuit.

All the earthing for any one stage should return to one point, and this point should return to the main earth.

An amplifier of this class requires three power supplies, or four if fixed bias is used on the output stage. The first power supply should serve the pre-amplifier, mixer and equaliser; the second should serve the paraphase, rectifier-amplifier, compressor and driver, and in the main supply should serve the plates of the 807's. The 807 screens should be fed from one of the other supplies.

THE MICROPHONE

Now, let us turn our attention to the microphone department. Without straying into various hybrid types, we can be fairly secure in saying that recording microphones fall into three broad classes. Velocity, dynamic and crystal.

The velocity microphone is the classical studio microphone. Its frequency response is smooth and extensive, the mass of its moving member is the lowest of all types, and its general sensitivity and reproduction of fine detail are outstanding. I do not refer to its *absolute* sensitivity, but to its relative sensitivity when dealing with the same acoustic situation as other types. It is bi-directional, and it can be electrically phased with another velocity microphone, merely by turning it through 180 degrees.

Unlike the dynamic, the frequency response does not vary with the angle of incidence. At the 90-degree and 270-degree positions the instrument is virtually "dead," which allows artists to move to the insensitive quarters of the microphone when they are not actually performing.

The velocity microphone is relatively fragile, and it is not wise to take it outdoors. Nor can they be used at a much closer distance than about two feet from the sound source, otherwise the reproduction tends to be unduly emphatic in the bass register. This, of course, reduces the effective output.

It also lays stress on the acoustic properties of the studio, since the reverberation pick-up is stronger when the direct source of sound is moved further from the microphone. Despite these characteristics, which are understood and allowed for, the velocity microphone has occupied an eminent position in recording and broadcasting for many years.

DYNAMIC V. VELOCITY

The dynamic microphone, a pressure-operated device, tends to have rather higher output than the velocity. However, its frequency response curve can have a great many sharp peaks and troughs, not far apart from each other. It is possible to work close to a dynamic, and it is a comparatively rugged instrument. It is perhaps the best general-purpose microphone since it is equally effective outside or inside the studio. Like the velocity, it is very susceptible to electro-magnetically induced hum.

Like the velocity, the dynamic usually works into a cascade input-transformer system. That is, a voice-coil to line transformer, feeding a line-to-grid transformer. The line may be 200, 500 or 600 ohms, but 600 ohms is common here.

Now the crystal microphone. This piezo-electric instrument may be regarded as a capacitive generator, roughly equivalent to about .004 mfd. It follows that fairly long shielded leads can be run from the microphone-head to the pre-amplifier grid without any trouble from high frequency losses. This unique feature eliminates coupling transformers and their associated insertion losses.

By Phil Edwards

Furthermore, rochelle salts are extremely active, and it is not uncommon for a crystal microphone to have 10 times the output of magnetic instruments. Another very attractive feature is that the crystal instrument has no magnetic circuit—and this means no electro-magnetically induced hum.

These two characteristics make this type outstanding for some purposes, mainly focused around the recording of speech. The crystal microphone, in particular the diaphragm type, has a diaphragm resonance which often falls in the middle-high-frequencies, around 3500 to 4000 cycles. This causes the reproduction to be a trifle shrill, unless equalisation is carried out. By the time the peak has been subdued the overall level may have fallen considerably, which puts us back to an effective level which is not quite so attractive.

CRYSTAL MICROPHONES

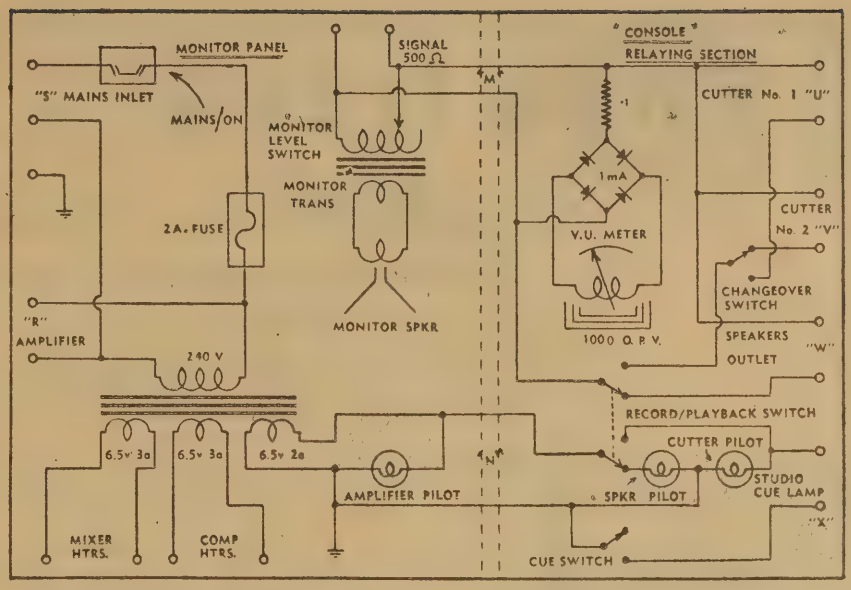
However, the *sound-cell* type of crystal microphone has a much more remote high-frequency peak, which may lie well outside the upper end of the useful audio range. To achieve this excellent response the overall output has to be sacrificed, but the microphone still has the *remaining* advantages of the crystal type.

On the other side of the leger, all crystal units are susceptible to temperature and humidity effects. But their transient response is outstanding, and some of the most impressive piano recording I have heard has been done with sound-cell crystal microphones. Engineers agree that the piano is always a troublesome instrument to record or reproduce, probably because of the very steep wave-front at the moment of impact as the hammer strikes the string. For piano work, speech, and some solo instruments it is desirable to have a crystal microphone on hand, even if it means another special channel to accommodate the high-impedance input.

TALK-BACK

Then we encounter the TALK-BACK system. This is an entirely separate amplifier, which feeds a loudspeaker in the studio and whose microphone is in the control room for the engineer's use. A diaphragm-crystal microphone is ideal for this. It must be possible for the engineer to throw one switch, which gives the circuits "recorder in, talkback out," "both out," and "recorder out, talkback in." The recorder amplifier and talkback amplifier cannot both be operated at once, owing to feedback problems. Not unless the monitoring is done on headphones, which is rather a crude monitoring system.

The monitor amplifier is another small, separate unit, which is best bridged straight across the cutting head. This position is preferred, because, if the input to the monitor amplifier is taken off from some other point within the main amplifier, subsequent stages in the main amplifier can break down without the fault being apparent in the monitor. The monitor level must be as high as practically possible without being audible in the studio.



This diagram illustrates the control wiring of the console and monitor system, including power supply wiring, cutter feed, monitor speakers and cue lamp.

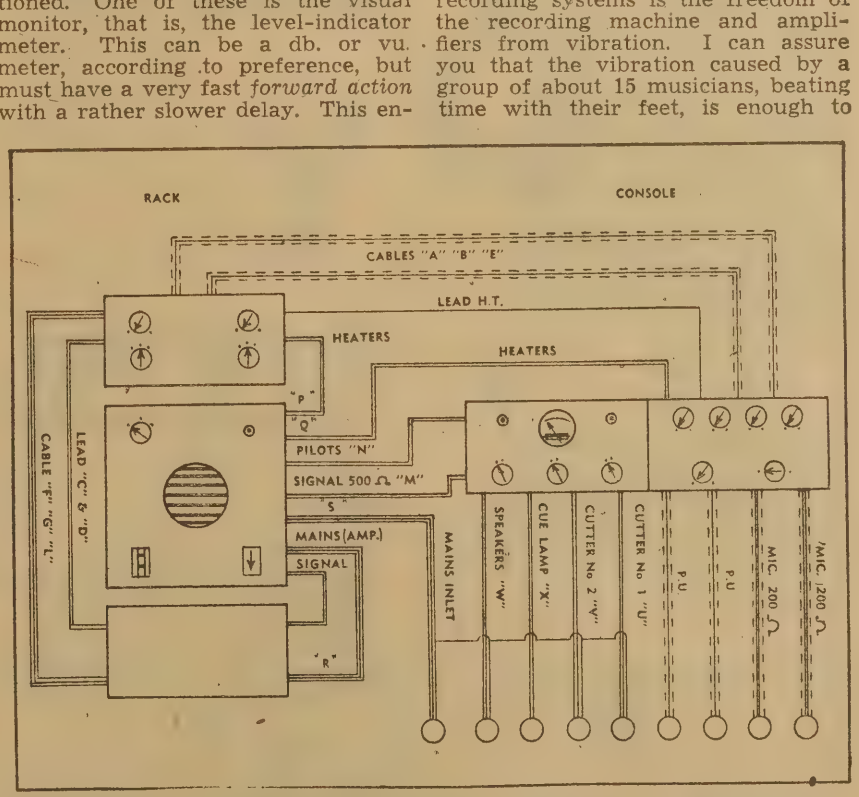
MONITOR VALVE

A valve like the 6L6 is indicated for this unit, and the frequency response and distortion, unlike the talkback amplifier, must be as good as the main recording amplifier. If the monitor is not "flat," and has appreciable harmonic distortion, it will not give a true picture of what is going through to the cutting head.

That completes the electronic line-up of the studio, and leaves several miscellaneous details to be mentioned. One of these is the visual monitor, that is, the level-indicator meter. This can be a db. or vu. meter, according to preference, but must have a very fast *forward action* with a rather slower delay. This enables the operator to get some idea of the true peaks which are passing through to the head. In this connection, the ordinary 0.1 milliameter is practically useless, because its action is too sluggish.

The level-indicator, with its multiplier, is bridged across the cutting-head, and marked with a red band at about two-thirds full deflection. The multiplier resistance is adjusted so that the head will be approaching the over-driven condition when the needle is at the higher end of the red band.

Another consideration in general recording systems is the freedom of the recording machine and amplifiers from vibration. I can assure you that the vibration caused by a group of about 15 musicians, beating time with their feet, is enough to



The wiring of the whole studio setup. Although complicated at first glance, it affords the operator full and convenient control over the various items of equipment.

throw the cutting head off the disc, unless precautions are taken.

STUDIO CONSTANTS

Yet another point is the acoustic nature of the studio. From the classical Sabine formula, "t" equals 0.05V/AS, where "t" is reverberation in seconds; V, volume in cubic feet; A, average coefficient of absorption of the surfaces, and S, total area of absorbing surfaces, we can get some idea of how the bare studio will behave. But the intrusion of piano, the speaker housings, the light and microphone booms and stands, chairs, and the performers themselves have a cumulative effect which makes Sabinet's formula a hollow mockery. It is, perhaps, sufficient to say that the studio should be made as dead as possible in the bare state. Then the additions will probably not make the studio aggressively reverberant.

Then there is the matter of sound effects. All studios have these, some of them being recorded, and others manually created. Effects like doors opening and closing, bells ringing, telephone conversations, revolver shots, breaking glass, drinks being poured, and so on, are usually standard effects which are performed by a special sound-effects man, who is a key member of the production staff.

The more sound-effects can be created IN the studio, the better, because the artist can hear them. Also, a certain amount of the illusion is destroyed if the sound-effects recording is a trifle worn, and we hear the surface noise, followed by the "effect," and then the abrupt cessation of the surface noise. Apart from this, it gives the engineer considerably more to do, if he has to attend to a number of turntables.

Cueing is, of course, done either by standardised signs from the operator, accompanied by many expectant looks from the artists, but it is more often done by lights. The exact method used varies from studio to studio, but one signal which all artists recognise is the appearance or otherwise of a red light on the microphone. This red light can be switched in by a pair of contacts on the microphone switch for any channel, but the contacts of the switch must be staggered so that the light circuit closes before the microphone becomes alive, otherwise an audible click may register in the programme. It is, perhaps, unnecessary to say the red light must be run on DC.

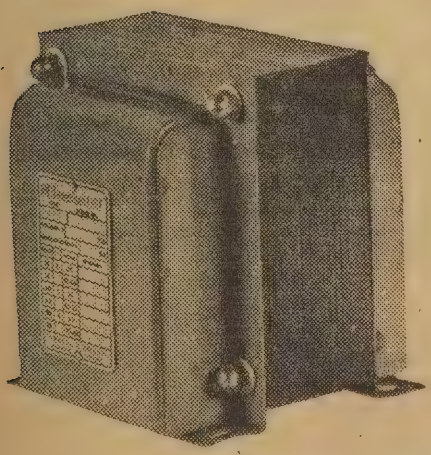
CONCLUSION

Finally, the studio and control room must be arranged so that artists and engineers can see each other plainly at all times, otherwise some incidents occur which are very funny in retrospect, but disastrous at the time of happening.

The lighting must be good, both in the control room and the studio. The lighting should not have any glare, otherwise the people on either side of the double glass window may have "blind spots," which are very distressing.

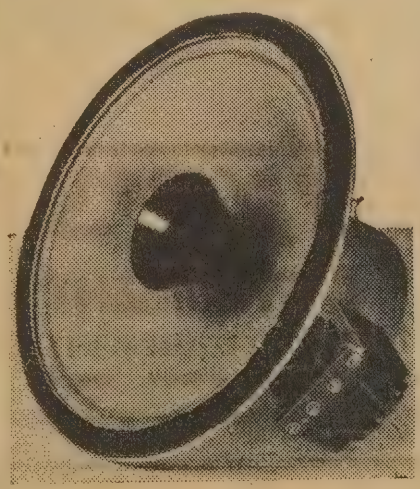
I might perhaps conclude by saying that if the people on the other side of the control panel had any remote conception of just how many things a recording engineer has to do, and how much he is expected to know—sometimes to a point of being almost psychic — they would get quite a surprise.

NEW HIGH FIDELITY COMPONENTS



THE Radiotron amplifier described last month requires a special output transformer to realise the full advantage of the circuit. Accordingly Swales and Swann have released a "Red Line" transformer to meet the exacting specifications. Types are available to suit output to line requirements, or to voice coil, as required. Response is substantially flat from 20 c/s to 30 Kc., while leakage inductance and insertion loss are particularly low.

Of special interest also, is a new imported speaker of Dutch design and manufacture. Preliminary tests in our laboratory have indicated excellent frequency response and freedom from peaks and intermodulation effects. Details are available from Philips Electrical Industries.



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A sturdy 0/1 milliammeter with a multi scale is the heart of the instrument. The sensitivity when making voltage measurements is 1000 ohm-volt, which is the standard sensitivity for measuring voltages in a radio receiver. All manufacturers' ratings of voltages on radio receivers are ratings when measured with a meter with a sensitivity of 1000 ohms/volt. Model V.R.M. measures up to this requirement. Four popular voltage ranges are incorporated. They are: 0/10 volts, 0/50 volts, 0/250 volts and 0/500 volts D.C.. A simple switch is incorporated at the top of the instrument and all voltages are clearly marked.

In addition to voltages this instrument measures resistance up to 100,000 ohms with a self contained battery. It can be used as a continuity tester for locating those open circuits. It is simple to use and instructions for use are shown on the face of the instrument. Model V.R.M. is available from the factory or from the distributor in your State. .. ..

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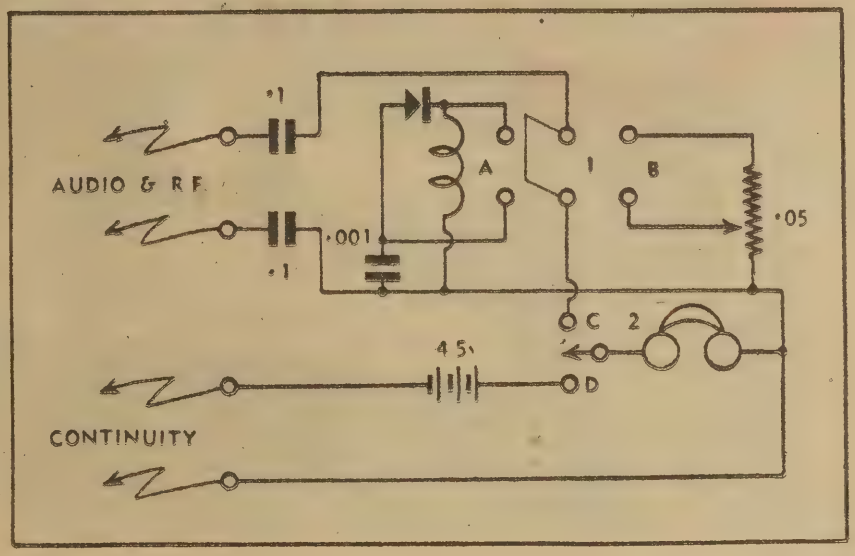
CIRCUIT TESTER USES NO METER

How to make up a circuit tester without using an expensive meter is always a problem. This article tells how one reader solved it.

MR. A. WOODHAM, of Narromine, NSW, says that he had used this simple tester for many years. He thinks that it should be interesting to students and experimenters, and helpful in tracking down faults which cannot be located by guesswork.

To check audio signals, use the appropriate leads, with switch number 1 at position "B" and switch 2 at position "C." The audio voltage is then fed through to the volume control and phones, where the signal can be monitored directly. In other words, the instrument functions as an elementary form of signal tracer.

If distortion is to be localised, for example, put the leads first between the plate and cathode of the output valve, then between the grid and cathode. If the signal is clear at the grid, but not at the plate, the distortion is evidently in that stage.



For radio frequency tests, set switch number 1 at "A" and switch 2 at "C," which brings the crystal detector into circuit. Place one prod on the plate circuit under test and the other on B-plus. Shift the lead from the plate to the grid and, if the signal is not much weaker, it is evident that the gain of the stage is low and that some defect is present.

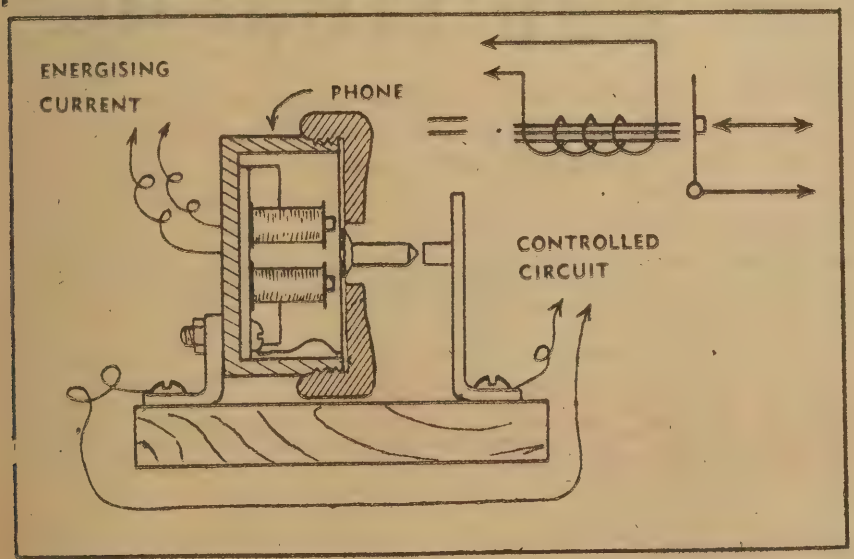
For continuity tests, disregard switch 1, and set switch 2 at "D." To test a fixed condenser, touch the prods to its terminals. A click should be heard in the phones. Remove the prods, wait a few seconds, and try again. The click should be much weaker, showing that the condenser has held its charge.

Tube filaments, resistors, coils and wiring circuits may be tested with the leads in the same position.

Variable condensers may be tested by first disconnecting the stators from the other circuits and checking them for continuity. No clicks should be heard as the condenser plates are turned.

Never use the tester on a receiver unless the batteries are disconnected or the power plug removed from the socket.

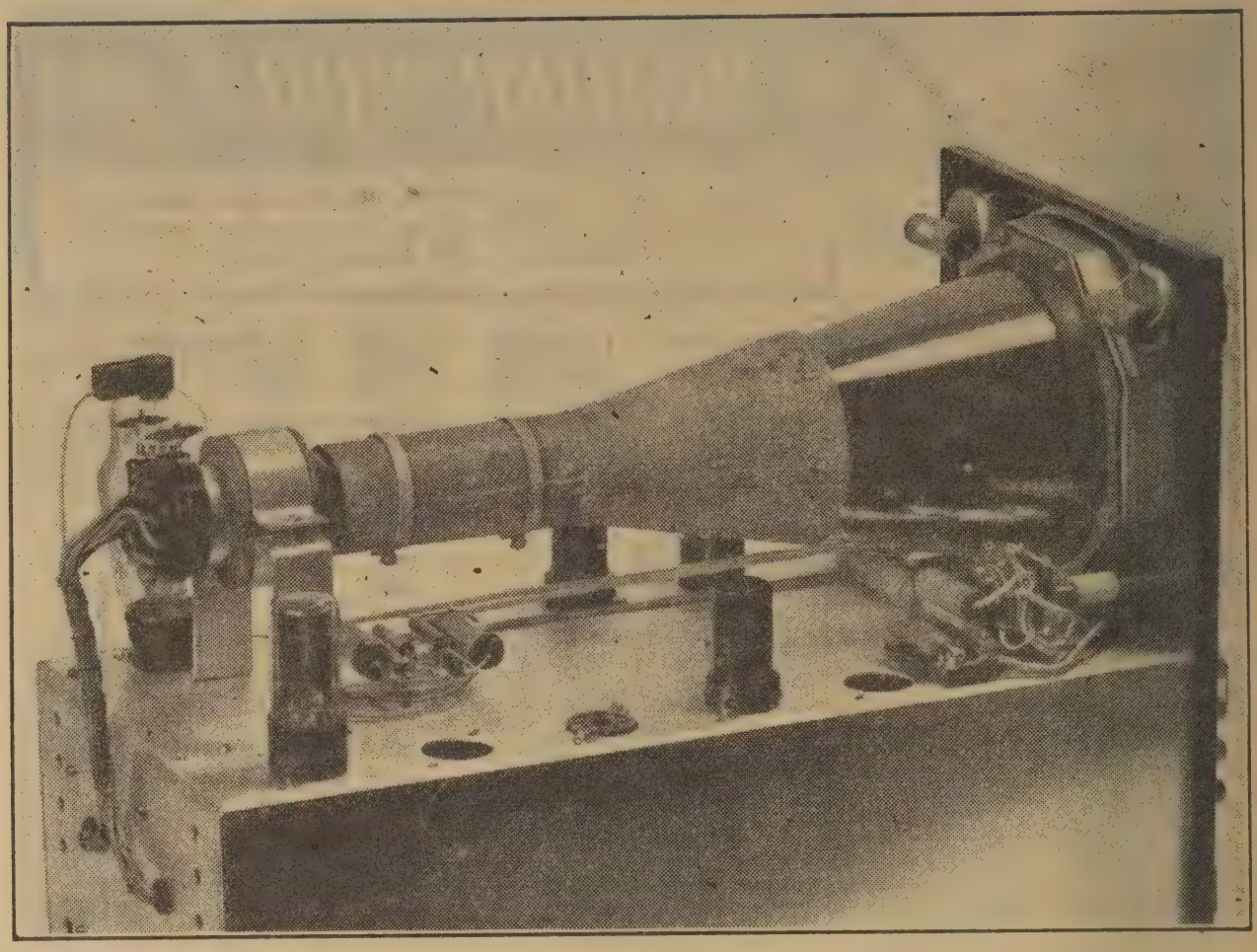
RELAY FROM OLD PHONE



For this suggestion we are indebted to Mr. J. D. Smith, 347 Warrigal-road, Burwood E13, Vic. An old earphone is firmly screwed to a wooden baseboard and contact established with the metal diaphragm. A contact screw is soldered to the centre, and this is lined up with another screw on a separate bracket. The contacts can be normally open or closed, the direction of movement being governed by the polarity of the energising current. Using an old 60 ohm PMG-type phone, the original relay could be adjusted to operate on as low as 3 milliamps.

Congratulations

CONGRATULATIONS on the high technical standard attained by "Radio and Hobbies," which is not excelled, if, indeed, equalled, by the several overseas magazines with which I am acquainted.—J. E. Jung, Eastwood, NSW.



A rear view of the instrument. Note the collar which supports the small end of the tube, with a layer of rubber packing. Leads to the socket are flexible and taped for neatness, the socket fitting as a cap. Note also the special support for the large end of the tube.

A FIVE INCH OSCILLOSCOPE

Here is an instrument which any radio amateur or serviceman will be proud to own. Built around a five-inch tube, ex-disposals, it is a big brother to the three-inch oscillograph described last month. High gain amplifiers and a standard time base make it applicable to all ordinary audio tests, while R.F. can be fed straight to the deflector plates for examination of a modulated carrier.

A COUPLE of years ago we would not have entertained the idea of describing a 5-inch oscilloscope, because of the high cost of the tube. A 1-inch or 2-inch job, maybe, but certainly nothing larger than that.

As it is, literally hundreds of 5-inch cathode ray tubes have become available from disposals sources for a couple of pounds each, and it is just as cheap, if not cheaper, to build the larger job. And you can take our word for it, a 5-inch screen is very much larger to the eye than a 3-inch screen, and a pattern on its face is impressive, even to the hardened radio enthusiast.

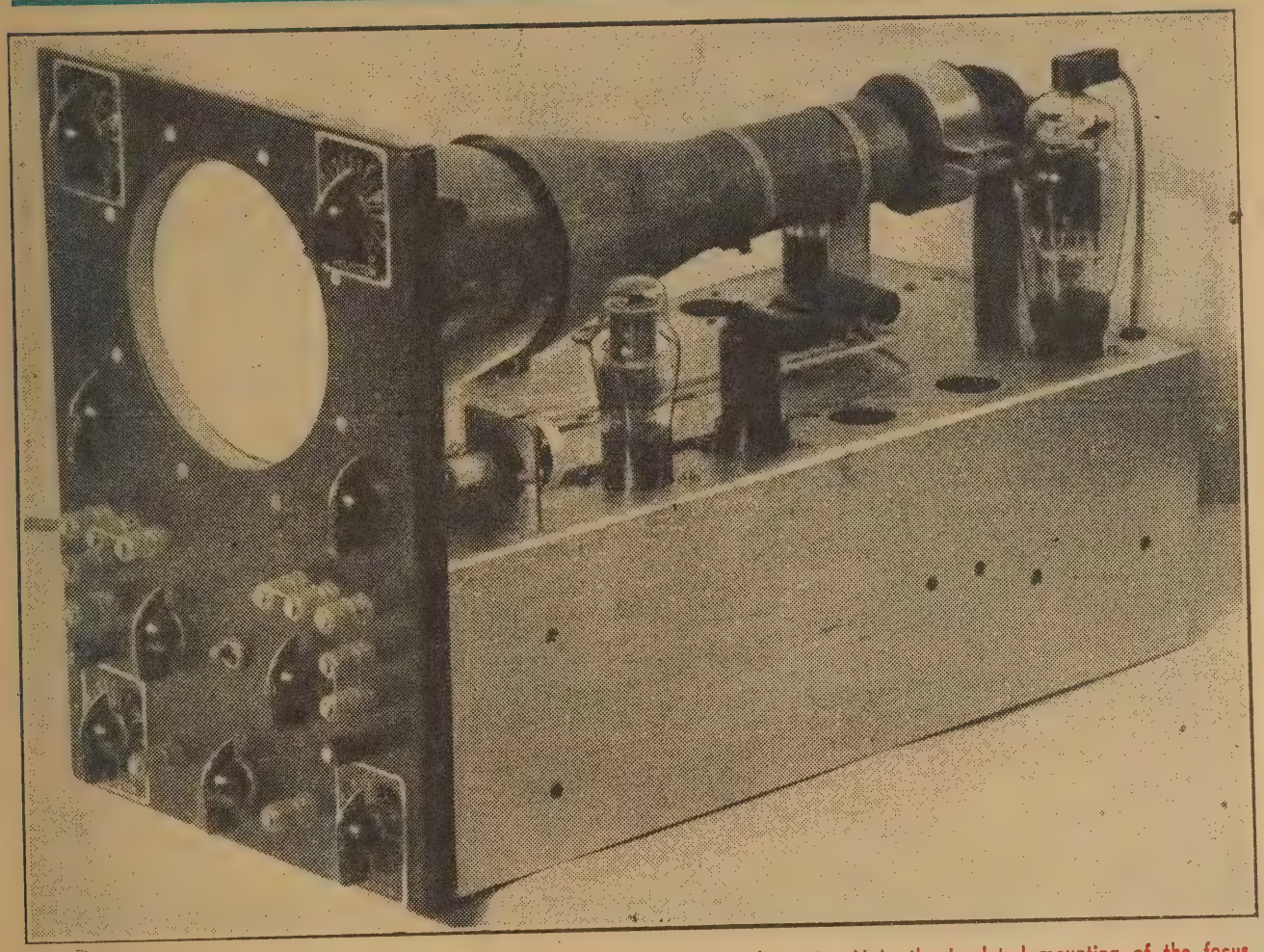
Appreciating these points, we did not attempt to go into any great detail about the 3-inch oscilloscope described last month. Having been built up some years ago for use in our laboratory, it was not difficult to show photographs of it and give sufficient details for it to be duplicated by any reader who happened to possess a 3-inch tube. Our main purpose, however, was to cover the broad principles of oscilloscope design as a background to the description of a 5-inch job.

HIGH VOLTAGE

The use of a larger tube involves a higher operating voltage, which adds somewhat to the complication of the power supply. A larger chassis and case is also required, but both items are more than offset by the difference in the price of the tubes.

Whereas you can buy a 5-inch tube for about two pounds, a 3-inch tube, through regular channels will cost about four times this amount. And there is certainly not that much difference in the price of the power transformer, case and socket.

We are assuming that this CRO will be built only by readers possessing a substantial technical background, so that discussion of the finer constructional points is hardly necessary. An oscilloscope circuit is not particularly complicated, the chief problem being in the actual



This view shows the front panel layout, which is described in detail in the text. Note the insulated mounting of the focus control. The glass valve near the front is the 884 gas triode, with the 6AC7 immediately behind and the high voltage rectifier in the rear corner.

number of parts which have to be installed and wired. Many hours will inevitably be consumed in the construction of the instrument.

Make up your mind right at the outset not to rush the job. The finished CRO will be a valuable and permanent item of equipment, and slipshod methods will only reduce its value and reliability. It is better to spend odd evenings at the construction rather than to try to rush it through all at once.

The circuit of the 5-inch CRO is generally similar to the 3-inch job described last month, but there are variations in detail and approach which warrant special mention. The first point, of course, is in regard to the power supply, which needs to be of higher voltage than for the 3-inch tube.

POWER SUPPLY

This is provided for by extending one side of the high tension winding to 900 volts, as compared with 575 volts in the earlier circuit. Practically the full peak value of this voltage appears across the filter circuit, so that about 1200 odd volts is available from this source. The positive side is earthed for reasons already explained. Actually the deflector plates, the final anode and the spot shift controls are returned to the positive supply for the amplifiers, so that an extra 200 odd volts is available for the tube, making about 1400 volts in all.

With this voltage, adequate definition is obtained in the 5BP1 tube, and certainly adequate for all normal laboratory requirements. Progressively higher voltages necesitate more careful treatment of the power supply, call for more precautions against insulation breakdown, and incidentally constitute a greater danger to the unwary constructor.

For the high voltage rectifier we

PARTS LIST

Chassis 17½ in. x 8¾ in. x 5½ in.
Front panel 12½ in. x 9⅛ in. x ½ in. (inside).
Case 18½ in. x 9⅛ in. x 12½ in. (outside).
Power transformer 350v. ct. 350v. 900v., 6.3v. at 1A (shielded), 6.3v. at 2A, (see text).
1 20mA. filter choke (see text).
1 7-position single bank rotary switch.
4 octal sockets, 1 11-pin CRO socket.

RESISTORS

5 2 meg., 1 1meg., 5 .5 meg., 2 .25 meg., 3 .2 meg., 5 .1 meg., 3 .05 meg., 1 .035 meg., 1 2500 ohm, 3 500 ohm. 5 1 meg. potentiometers, 1 .5 meg pot., 2 .25 meg. pots. (one with switch).

HF CHOKES

L1 and L2 60 turns 35 SWG enamelled wire wound on ½ in. dia. resistor (4 or 5 watt type).

CONDENSERS

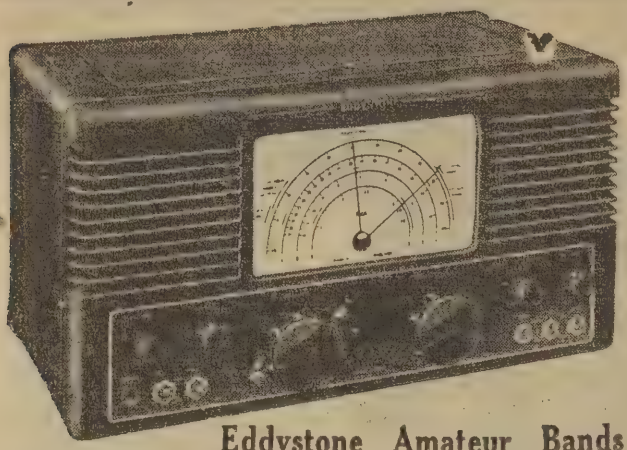
8 8mfd., 1 25 mfd., 2 .5 mfd., 1 .15 mfd., 9 .1 mfd., 5 .05 mfd., 1 .02 mfd., 1 .003 mfd., mica, 3 .002 mfd. mica, 1 .0008 mfd. mica, 1 .0001 mfd. mica, 2000 volt (or 3 .00025 mfd. mica in series).

VALVES

1 5BP1 (1802-P1) C.R.O., 1 AV11 (half-wave rectifier), 1 5Y3GT, 1 884, 2 6AC7.

SUNDRIES

14 terminals (12 red, 2 black), 9 pointer knobs, indicator plates, 2 insulated couplings, 1 C.R.O. mounting, scrap aluminium, sponge rubber, resistor strips, hook-up wire, tinned copper wire, spaghetti, brackets, carrying handle, rubber grommets, power flex and plug, 4 rubber feet, nuts and bolts, &c.



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3. Inclusive all valves, the "640" is a 9-valve job with one tuned RF stage, FC, two IF stages, detector-AVC-1st audio, 2nd audio output, noise limiter, BFO and rectifier. The valves used, in that order are EF39, 6K8, EF39, EF39, 6Q7, 6V6, EB34, EF39 and 6X5. These are all international octal based on the Mullard or Brimar versions and are therefore easily replaceable.
4. INPUT IMPEDANCE—400 ohms.
5. TUNING RANGE—
   (1) 31 to 12.5 Mc/s.
   (2) 12.5 to 5 Mc/s.
   (3) 5 to 1.7 Mc/s.
6. TUNING. An electrical band-spread arrangement is used for this purpose. Fly-wheel control is utilised on the band-spread condenser drive. The scale is clearly marked with all amateur bands, and is so arranged to enable accurate re-setting to a spot frequency.
7. I.F. FREQUENCY—1600 Kc/s.
8. CRYSTAL FILTER is vacuum mounted to provide a high degree of stability. Phasing control and "in/out" switch are brought out to the front panel.
9. Sensitivity is better than 2 microvolts input, for 50 milliwatts output, at all frequencies.
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11. "S" METER. A socket is provided for an external "S" Meter.

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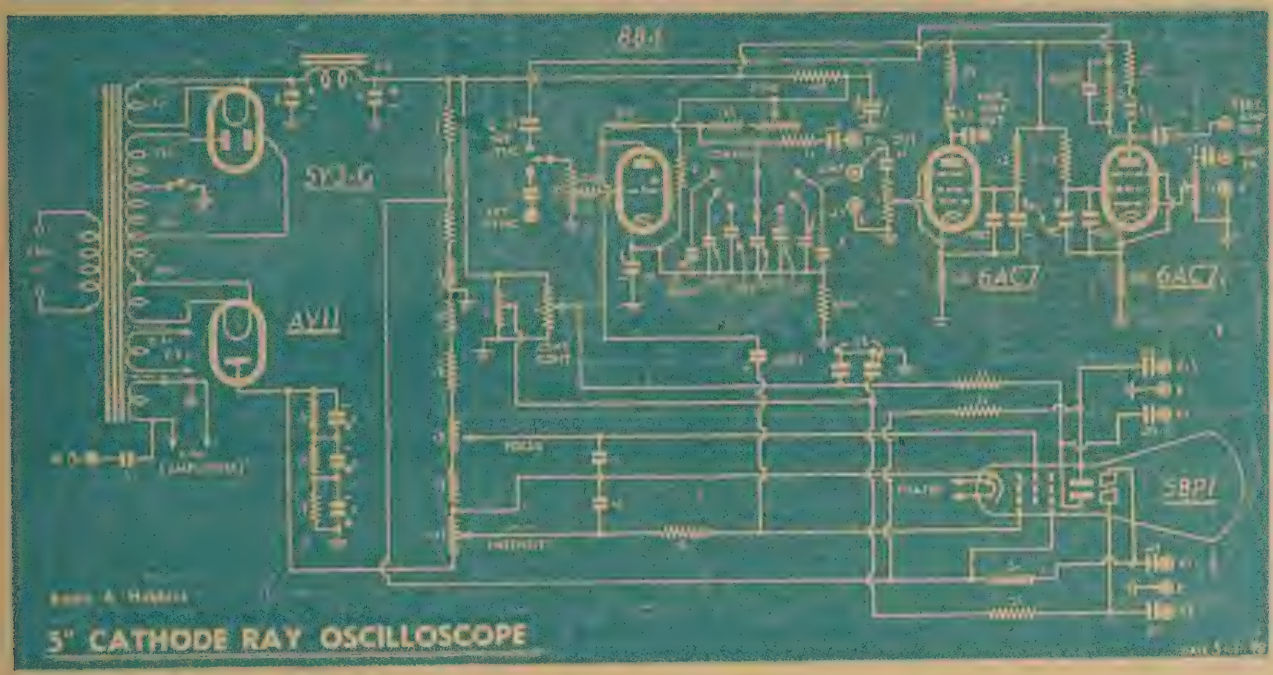
CIRCUIT OF THE FIVE-INCH OSCILLOSCOPE



This circuit is essentially a straightforward one, showing no departure from proved design for a general purpose instrument. The AV11 reatifier filament is rated at 2.5 volts, 2 amps. This winding must be added to the transformer ratings in the parts list.

used an English type AV11, taken from an ex-disposals radar transmitter. These have a high peak inverse voltage rating, and there must be large numbers of them around, complete with ceramic sockets. The AV11 has a 2.5-volt heater, requires a 4-pin socket, and has a top cap plate connection.

There are, doubtless, other similar rectifiers in odd pieces of equipment, which could be applied equally well to the task. The main point to watch is that the transformer will handle the filament requirements, delivering the right voltage and current, and with ample insulation between the filament and adjacent windings.

As an emergency measure, it is possible to use the 5Y3-G or 80 rectifier with, however, some risk of breakdown in the stem of the valve. The risk is apparently not too high, as this well-known rectifier was used to our knowledge in at least one well-known overseas oscilloscope. But use a high voltage rectifier for preference, and, if one of the ordinary receiving type rectifiers has to be employed, make sure that you use a good quality socket and take care with the wiring and soldering flux. Do not use an indirectly heated rectifier, by the way, as the spacing between cathode and plate is usually too small for safety at high voltages

CONDENSER FILTER

A simple condenser filter is all that is necessary for the high voltage supply, but an effective capacitance of around 2 mfd is necessary both for filtering and to realise the full available peak voltage. You may be fortunate enough to have a suitable condenser on hand, but the alternative scheme of using three series-connected 8 mfd condensers is a perfectly practicable one. Use 600 volt condensers for preference, thus achieving an adequate margin of safety, even with some unbalance in the individual condensers.

The power transformer itself is necessarily a special item, but we are advising manufacturers of the specifications. The suggested high tension secondary is 350 volts per side, at a nominal 20 milliamps for the amplifiers and sweep circuit. One side of the secondary is extended to 900 volts for the CR tube supply. For the high voltage rectifier, a 5.0 volt secondary is suggested, tapped at 2.5-volts for the AV11 or a similar rectifier.

RESISTOR NETWORK

For the CR tube, a 6.3 volt 1.0 amp winding is required, which should preferably be shielded. Another 6.3 volt 2.0 amp secondary is required for the other heaters, and a 5.0 volt 2.0 amp secondary for the low voltage rectifier.

It is important that the transformer be wound to have a very low flux density in the iron core, thus minimising direct magnetic defocusing of the tube. The matter of flux density and the unusual insulation requirements operate against schemes involving the use of a couple of receiving type transformers wired in series.

Even with the special low flux transformer, some difficulty is to be expected with magnetic defocusing of the beam, necessitating special shielding of the tube. The use of a mumetal shield and proper placing of the transformer in the original instrument permitted the effect to be so reduced as not to necessitate use of a separate power supply. But more of this anon.

The network of resistors across the high voltage supply draws very little current and allows a wide range of control over the focusing and intensity voltages. Operation of these controls is thus rendered a trifle more critical than usual, but the circuit is applicable to tubes other than the 5BP1, which may require different operating voltages.

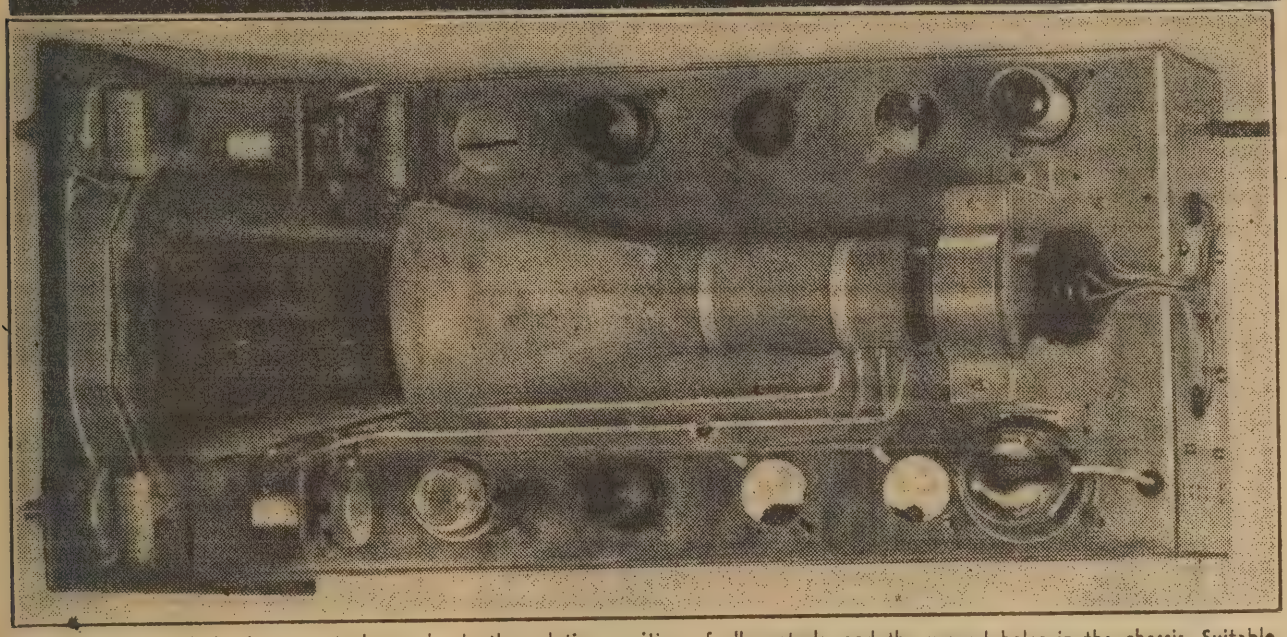
The low voltage supply is quite conventional, and, because it has to supply an appreciable number of milliamps, a pi-section filter is employed. The choke used in the original instrument was specially made for the job, being comparable in size with an ordinary loudspeaker transformer, but with an effective inductance of about 40 henries.

As we explained last month, one can go to great lengths in a large oscillograph to obtain the very best characteristics and we plan ultimately to develop this oscilloscope into a fairly advanced instrument, with push-pull deflection, an improved time base and so on.

REFINEMENTS

However, these items are essentially refinements which more or less "add the cream to the cake." They are warranted ultimately in our case because the instrument is required for full scale laboratory work, where detail is sometimes important.

ABOVE CHASSIS VIEW OF THE OSCILLOSCOPE



This plan view of the instrument shows clearly the relative position of all controls, and the unused holes in the chassis. Suitable magnetic shielding around the neck of the tube is essential if the power transformer is mounted on the same chassis.

For the present, however, we have been content to build up the instrument in a simpler form, with single-ended amplifiers and a conventional time base.

In this form it is readily applied to all normal audio tests. The additional features will be included and described in the near future and you can add them to your own instrument if and when you feel inclined.

For the two sweep amplifiers, we suggest using type 6AC7 valves. These are available cheaply and give high stage gain when operating into a relatively low plate load. This latter point is important in achieving good high frequency response. As a further step in this direction, small chokes are wired in series with each plate resistor.

H.F. CHOKES

These high frequency chokes can be wound by hand and comprise 60 turns of 35 swg gauge enamel wire, wound in a single layer on a ¼in. diameter former. Actually, we wound them on a couple of high value 5-watt carbon resistors, which simplified mounting into circuit.

The circuit constants shown are right for the 6AC7 valve but other high-slope types, such as the VR65, VR65A and EF50, will operate satisfactorily under the same conditions. In fact, we plugged a 6SJ7 into the same socket and observed no change in the trace, apart from the expected reduction in amplitude.

However, for the 6SJ7, 6J7-G or other similar types, the plate load can be increased to 0.1 megohm, the screen resistor to 0.5 megohm and the bias resistor to 1000 ohms. You will find that the linearity of any of these types is adequate for all normal observation of waveform.

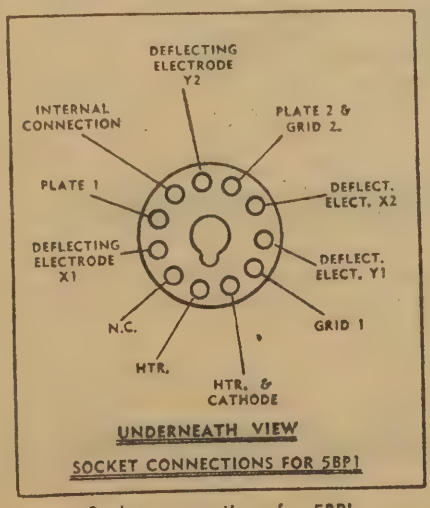
A word about the operating conditions. A sustained bass response is absolutely essential in both amplifiers. In the vertical amplifier it is important because the height of the trace is likely to be taken as an indication of the frequency response of apparatus under test. In the horizontal amplifier, a limited bass response will detract alarmingly from the linearity of the sweep, so that unwarranted blame may attach to the 884 gas triode.

CATHODE BYPASS

For this reason, it is absolutely essential to use an 8 mfd bypass on the screens of the amplifiers or to adopt some other circuit method which will prevent degenerative effects in the screen circuit at low frequencies. The usual 0.1 mfd screen bypass is quite useless.

In the cathode circuit, the ordinary 25 mfd bypass is likewise inadequate and the alternative is to omit the condenser altogether, put up with the loss in gain, but benefit by the feedback which is thus introduced.

In our circuit, we have reduced the cathode resistor to the lowest possible value to minimise loss in gain, leaving it unbypassed. The screen bypass returns direct to cathode instead of to earth.



Socket connections for 5BP1

With these precautions, the vertical deflection sensitivity at about 17 c/s —the limit of our generator—is the same as at middle frequencies. Linearity of the time base at its lowest frequency is also very good.

Then there is the matter of the sweep oscillator. We intimated last month that experiments were in hand with hard valve time base, and such indeed was the case. The particular circuit was one published recently in an English journal, using the negative transconductance effect between the suppressor and screen grid of a pentode.

HARD TIME BASE

At first trial the circuit gave considerable promise and, indeed, would appear to be a good one for fixed frequency work. However, for oscillograph work, it has to be made continuously variable over a wide range of frequencies and some of the simplicity disappears. Two sets of fixed condensers have to be switched and this represents considerable complication at the very outset.

The trace has a small but troublesome "pip" at one end and the high frequency component appears to be very prone to capacitive coupling to the deflector plate wiring, giving a slight elongation of the spot. There is some difficulty about blackout of the return trace and a suggestion that there would be variation in behavior from one valve to the next.

DIFFICULTIES

None of these points rules out the circuit as impracticable and, indeed, further development may reveal it as a very satisfactory arrangement. However, we did find ourselves try-

ing to circumvent uncertainty and difficulties, just to use a pentode valve in place of the gas triode. These latter valves are scheduled for local production very soon and the difference in price would be offset in some degree by the fewer parts which the conventional circuit requires. So, rightly or wrongly, we decided to go back to the gas triode and to improve upon its performance in the more elaborate instrument by adding a linearising pentode.

GAS TRIODE

In the meantime, however, the wiring for the pentode was removed and a conventional circuit installed for the 885 gas triode, which happened to be the one available. For the heater supply, we used a small auto transformer operating from 6.3 volts. In the normal way, you would use the 6.3 volt, octal-based 884. As if to vindicate our decision, the 884 circuit operated perfectly from the moment it was switched on. The circuit differs in minor detail from the one published last month, but the differences are of no practical consequence.

A couple of the condenser values in the sweep circuit are odd, but you may be fortunate enough to obtain them from a distributor. However, the odd values can be arrived at quite simply by connecting two standard condensers in parallel.

The physical layout of the instrument warrants special comment. The chassis is 17½in. long, which corresponds roughly to the overall length of the 5BP1 tube. It is 5½in. deep, sufficient to allow for under-chassis mounting of the power transformer and a goodly number of the panel controls. The width of the chassis is 8¾in.

FRONT PANEL

The number of terminals and controls to be fitted to the front panel largely sets the width, so that the general dimensions of the instrument follow more or less automatically. The front panel is about 3-8in. wider than the chassis and the ½in. lip is bent back all round. The panel attaches to the chassis by the various control spindles and clearance must be arranged at the sides and bottom between the inside of the flange and the outside of the chassis.

The shield case measures about 18½ x 9 1-8 x 12½ inches, but should be made a neat push fit inside the flanges of the front panel. Obviously, the chassis, panel and case must be made to fit together, as even small discrepancies could render them useless.

We had the case finished in black crackle lacquer, the chassis cadmium plated, and the rear of the panel in plain black lacquer. The front of the panel was given a dull black finish, which would lend itself to lettering at a later date. You may or may not be as fussy as this, but a metal chassis, panel and shield box is highly desirable for the instrument.

C.R. TUBE SUPPORT

To support the small end of the CR tube, we manufactured an aluminium bracket with a clamp at the top, which holds the tube firmly with a layer of rubber packing all round. The front of the tube rests in a rubber-lined mounting ring, which was salvaged from an old radar indicator. If you are not so fortunate in this connection, make up some similar flange or surround which will cushion the large end of the tube and avoid contact between the glass and metal edge of the panel. The valve-socket simply fits on to the pins of the valve as a loose cap.

The arrangement of the controls and terminals on the front panel is worthy of special comment. The spot shift potentiometers are at the top of the panel, one to either side of the tube face. Both of these are mounted directly to the metal panel in the usual way.

Underneath these are the intensity control on the left and the focus on the right, the intensity control carrying a switch to break the high tension

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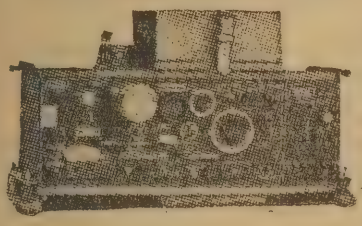

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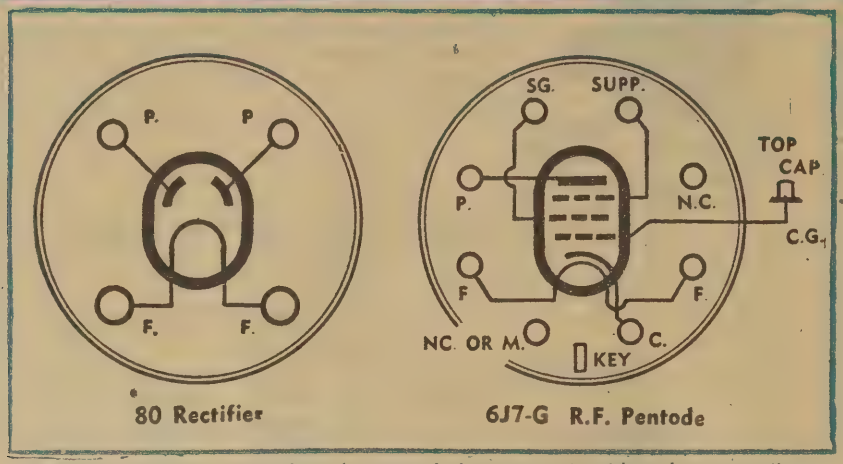


Typical valve sockets showing how the internal elements tie in with socket connections.

When confronted with the parts for set and a schematic diagram, beginners are often at a loss to identify the various valve connections. Only familiarity will acquaint one with the various base connections and circuit drawings, but the following points will at least be a help.

IN Australia there are no less than nine different types of valve socket in general use. These range from the old style 4-pin to the modern octal and the miniature 7-pin "button" sockets. The accompanying diagram shows how the pins are laid out and their relative size.

You will notice that all the old style sockets except the 5-pin have two pins larger than the others. This is to facilitate identification and to insure that the valve can only be plugged into the socket as intended. The two larger pins are normally used for the filament or heater connections. The irregular pin spacing with the 5-pin socket serves the same purpose.

PHILIPS TYPES

An important point to note is that it is standard practice to list all valve connections as they are viewed from underneath the socket, or looking on the base pins. A standard numbering system is adopted and this can be best explained as follows:—

Hold the valve base up with the large pins towards you, and the large pin on the left will then be pin 1. The rest of the pins are then counted around in a clockwise direction. Note how the 5-pin socket is numbered.

In the case of the octal and the miniature 7-pin sockets the same general procedure can be adopted. The octal socket has a locating pin which is provided with a keyway. Holding the socket base-up and towards you, the pin to the left of the keyway is pin 1 and counting around clockwise, the pin to the right of the key is pin 7 or pin 8, as the case may be. There is no locating pin on the miniature socket but a space is left between pins 1 and 7 and this serves the same purpose.

To the beginner the various valve type numbers appear somewhat complicated. Admittedly, with the American series, there doesn't seem to be any definite way of telling just what a valve is and does from the type number. However, the suffix does indicate the type of envelope in the case of the octal-based valves, which are now in general use. For example, "-G" indicates that the valve has a medium sized glass envelope, while "-GT" valves are manufactured with a small tubular glass envelope. If the suffix is omitted the valve generally has a metal shell. In many cases the first figure of the type number indicates the filament or heater voltage.

Thus type 5Y3-G has a filament designed to operate on 5 volts and a medium sized glass envelope, while a 6F6 has a 6.3 volt heater and a metal envelope.

UNDER THE BASE

Philips have a fairly comprehensive system for numbering their valves. The first letter represents the filament voltage, the second letter or letters indicate the general type such as diode, triode, pentode or hexode, and combinations of the basic type in the same envelope. The following number is selected in an arbitrary manner and indicates modifications to the basic type, while the last letter or figure is related to the type of envelope employed.

Many of the simpler types in the octal series do not require all eight pins to make connections to the various elements of the valve, and pins are often left blank or, in many cases, omitted from the base altogether.

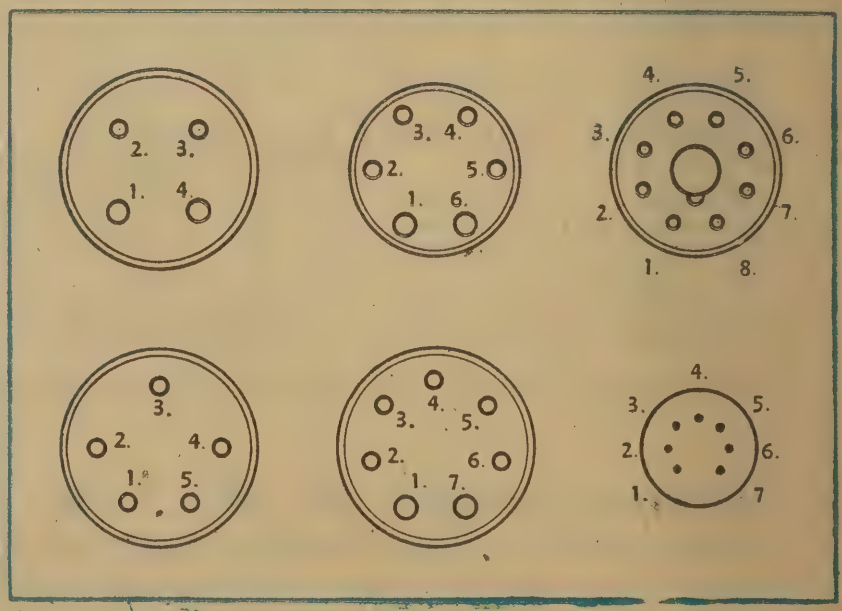
The circuit symbols for various valves puzzle many on their first attempt to build a set and a few remarks on the subject would probably be relevant at this stage.

ELECTRODES

A circle or ellipse is usually drawn to represent the envelope; at the top of this ellipse a rectangle is the symbol for the plate, while the various grids are represented by dotted lines. At the bottom of this ellipse an arc represents the filament while, in the case of a-c operated valves, another arc is drawn to represent the cathode.

The various grids of a multi-element valve are sometimes hard to work out. For instance, a tetrode

(Continued on Page 54)



Some common valve socket types and their numbering. The new miniature socket is shown at bottom right.

THE SIMPLEST RECEIVER IN RADIO

SOME POINTS ABOUT CRYSTAL SETS

The first radio sets ever used employed crystal detectors. Today, crystals are used only in special receivers where other types are not suitable, but it is still possible to get good headphone signals from local broadcasters on a very cheap, simple crystal circuit. In this article are discussed the general properties of a crystal set.

A CRYSTAL set is characterised by the fact that it uses no valves and therefore does not require any form of voltage supply—either from batteries or the power mains. It will operate indefinitely without operating costs, apart from the very necessary item of a broadcast listeners' licence. The big drawback is, of course, that the reception range is limited to about 15 miles in the majority of cases and the signals are then audible only on earphones.

A crystal possesses the ability to rectify alternating current, irrespective of frequency. In other words, it will permit current to flow through it in one direction but very little in "reverse."

DETECTION

Therefore, when a piece of crystal is placed in a circuit, as shown in the accompanying diagram, the incoming signal or radio frequency voltage present across the tuned circuit is "detected" and the resulting audio frequency pulses pass through the earphones back to the earthed side.

A small condenser is usually placed across the earphones to bypass the radio frequency component in this section of the circuit.

The audio frequency currents, passing through the windings in each earpiece, cause slight changes in the magnetic field between the two magnet poles. The diaphragm, a circular piece of light gauge iron which actually produces the sound, is held just clear of the pole pieces.

Because of these changes in the magnetising force exerted upon it, the centre of the diaphragm flexes to and from the pole pieces in sympathy with the signals. This mechanical vibration produces sound waves which resolve into the same intelligible speech and music as broadcast by the station to which the crystal is tuned.

COIL TAPS

The taps on the tuning coil allow for rough "matching" of the aerial on the one hand, and the rectifier and the earphones on the other. In practice, the taps which give the best general performance in the phones are selected. Tapping of the aerial and crystal down the coil reduces the "loading" effect and will generally give an increase in selectivity at the expense of volume.

A typical coil would have 80 turns of from 20 to 40 gauge wire on a two-inch former, tapped every 10 turns. This coil is suitable for the broadcast band — crystal sets are not successful on short waves.

The tuning condenser for a crystal set is normally specified as .0005 micro-farad or 500 micro-microfarad, to use an alternative method of expression. This is a more or less conventional or traditional figure and, in practice, any value between .0004 and .0005 mfd will serve the purpose. Values lower than this are scarcely suitable, since their tuning range is not sufficient to allow them to cover the whole broadcast band.

Fortunately the tuning condenser does not need to be a mechanical masterpiece, and any of the ordinary types available in radio stores will be satisfactory. The main points to watch are that the capacitance is correct and that the plates do not actually short-circuit as they are rotated.

The circuit, by the way, comes from the October, 1946, issue of "Radio and Hobbies," in which it was fully described. It is a simple but very satisfactory design, well tried over many years.

CRYSTALS AND VALVES

Crystal sets are practically as old as radio itself, and time was when most receivers were of this type. However, the louder signals and the greatly increased range made possible by the use of valves, soon swung matters in their favor.

But the crystal has not been completely superseded. Equipment designed and used during the war years employed a highly developed crystal for the detection of ultra high frequency signals, when the leads to the elements of even special valves become too long for satisfactory operation.

One type of mineral used in these cases is germanium which, for practical application, is fitted into a special miniature holder and looks rather like a small carbon resistor.

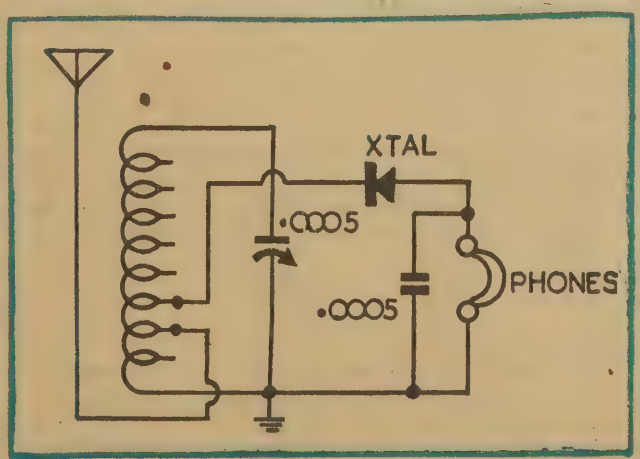
In the ordinary crystal set, no amplification can be given to the signal received. All things being equal, therefore, the performance of the set is governed by three or four major factors. These are the "Q" of the tuned circuit, the sensitivity of the crystal, the efficiency of the aerial system, which, of course, includes the earth, and the efficiency of and the loading presented by the headphones.

The "Q" factor is a technical term used to denote the electrical efficiency of the tuned circuit. The use of heavy gauge or multi-stranded wire generally improves efficiency, as well as a coil former with a 2in. to 3in. diameter, which will be about the length of the winding.

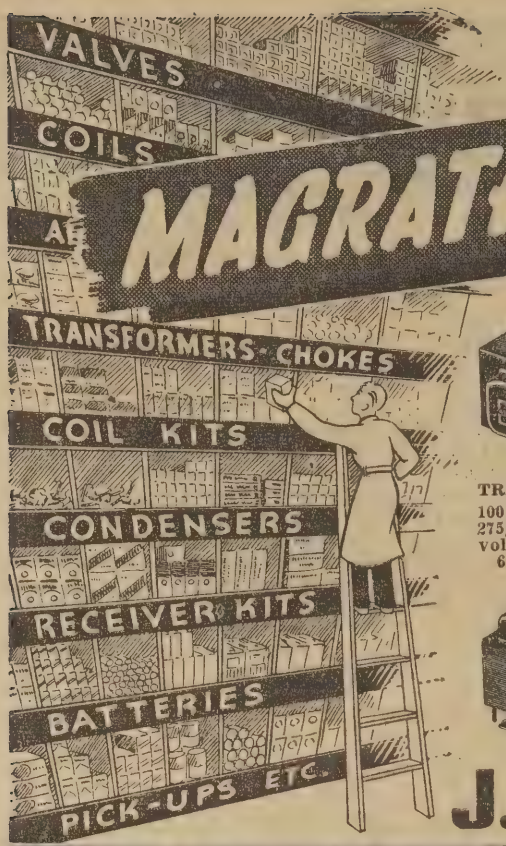
WIRE SIZE

There is naturally a physical limit to the size of wire one may use, but wire as heavy as 18 SWG is not difficult to wind on a suitable former. Wire gauges between 18 SWG and 24 SWG, enamelled or double cotton covered, will do. The direct difference in results with a coil wound with lighter gauge wire may not be very much in itself, but it is desirable to take advantage of every little increase in efficiency—in the coil, the headphones, the crystal and the aerial—earth installation.

The sensitivity of the crystal depends partly on the type and partly on the method of assembly. Good quality crystals, fully enclosed in a holder usually give good and consistent sensitivity for a long period. In holders where the point of contact is exposed to the air, dust and other foreign bodies collect on the rough surface, and difficulty is sometimes experienced in getting a good contact. Dust and other matter introduce an undesired resistance, with the result that a portion of the already minute signal voltage is lost.



A typical crystal set circuit. Winding details of the tuning coil will be found in the text of the article. Selectivity is best when used beyond the immediate vicinity of stations, although volume will be less.



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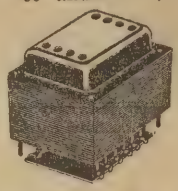

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If a crystal is dirty, it can be cleaned by using a small brush in a cleaning agent, such as carbon tetrachloride. Once it is clean and dry, it is wise to handle it with a pair of tweezers, as an oily film may otherwise be left on its surface by the fingers.

In previous articles, we have referred to the importance of an efficient aerial and earth system. With a crystal set, this applies with double emphasis, because we rely entirely on the incoming signal for volume in the earphones.

With a larger set a reduction in signal strength, due to a poor aerial and earth, is offset merely by turning up the volume control a little further and allowing the valves to give greater amplification. But there is no such facility in a crystal set, a weak input signal meaning simply a corresponding reduction in the volume of sound from the earphones.

AERIALS

Broadly speaking a crystal set must be used with an outdoor aerial at least 30 feet long and preferably 15 feet or more in height. It is better to have a large aerial tapped well down on the coil rather than try to operate with a short aerial up near the top of the coil.

The earth, too, is an essential feature, and in most cases a crystal set simply will not operate without it. The earth wire should run to a clamp around a galvanised water main, or to a length of pipe driven into moist soil or, yet again, to a sheet of metal buried a couple of feet underground.

Last but not least is the matter of the earphones, which are likely to vary widely in characteristics.

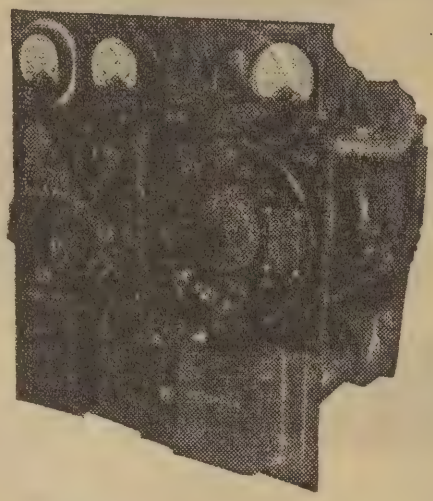
Earphones normally have an impedance of from 2000 to 4000 ohms, and operate well either in the plate circuit of a detector valve or in a crystal receiver of the type under discussion. However, many earphone sets which have become available recently from war disposal sources have an impedance of only about 400 ohms, and are less suitable for use in small sets—valve or crystal. The reason for this is simply that the amount of current flowing through the crystal and earphone circuit is limited, and a greater power is likely to be developed across the higher impedance windings.

HEADPHONES

Another point is that the sensitivity of earphones is dependent on the efficiency of the magnetic circuit, and some of the very old phones, particularly those of cheap manufacture, suffer badly on this account. The loss in sensitivity due to poor magnets, &c., can completely offset the advantage of high impedance windings, so that many constructors find they can get just as good results from modern low impedance phones as from high impedance units which have been passed down the family tree.

However, the ideal phones for a crystal set are high impedance units of modern or efficient design.

USED DISPOSALS EQUIPMENT



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Less valves and power supply, valves used are 2-V125 Triodes.

Complete with coils covering from 6m.c. to 10m.c. Also the following meters, 1.0-150 M.A.D.C. 1-0-3amp Thermo-amp. meter and 1.0-2.5amp Thermo-amp. meter.

THIS TRANSMITTER IS SUPPLIED IN ITS ORIGINAL CARRYING CASE.

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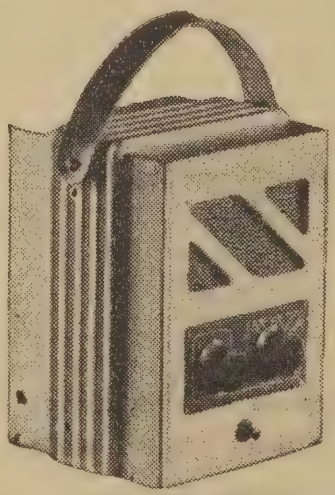

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Complete Handi-Talki Sets—Immediate Delivery.

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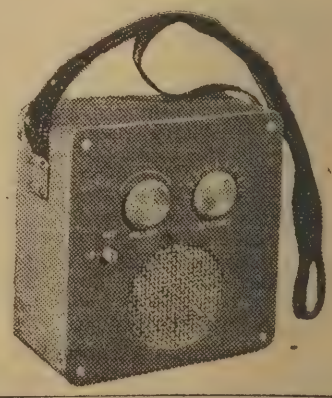
As Illustrated Basic Kit includes—

Tuning Unit with Volume control and Switch Chassis mounted with Valve Sockets. Battery Carrier Clips. Case with all panels and rubber feet. Carrying Strap embodying Aerial with mounting plates. Knobs and Chrome Speaker Grill. 2 I.F.S. Spacers etc. Circuit for wiring and full details of stage by stage wiring. **PRICE £10/10/-** Immediate Delivery



MAXWELL'S RADIO

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Add Postage to all amounts—Same day despatch.

FROM THE SERVICEMAN WHO TELLS

Of all the complaints servicemen have to listen to, I suppose that fading is the one they appreciate least of all. Personally I prefer a good old-fashioned breakdown any day. At least you can locate the cause and be sure when it is fixed.

I HAVE already had something to say about fading troubles and do not propose to repeat myself more than necessary.

Briefly, my procedure is to switch the set on in the home, and, while keeping one ear cocked to the receiver, to try to deduce from the owner just what form the fading takes.

If it is always gradual, I suspect a valve heater or the connections thereto, or a gassy valve affecting the AVC line. If there is distortion at the same time, attention will focus on the audio end, particularly the output valve and its grid resistor.

On the other hand, when fading is accompanied by a plopping noise or is abrupt in character, I try to discover whether it is in any way related to the operation of the light switches, etc. In fact, I generally try two or three switches, just in case.

A set which is receiving most of the signal pickup through the power mains is often affected this way, particularly if it does not boast an efficient AVC system. A better aerial and earth will generally cure this trouble.

VOLUME CHANGES

Other than this, abrupt changes in volume can be attributed to almost any part in the set and the only approach is to try to discover the source of the trouble by using a signal tracer on the bench or by using a meter to discover some variation in the operating voltages with changes in signal level. In a bad case, one may have to track the faulty component by the painful process of elimination.

However, I have said something along this line before. What I have never struck before was one particular cause of fading. The set was a good quality 6/7 valve table model, which was said to fluctuate in volume for a few minutes after switching on.

Without disturbing it more than I could help, I turned the cabinet and removed the top of the valve cans, so that I could see down inside them. After that I switched the set on and awaited developments.

Sure enough, it had only been on about two minutes when the volume faded down to about half, and I had to advance the volume control to bring it up to listening level. A moment later, it swelled out again, so that I had to turn the gain back.

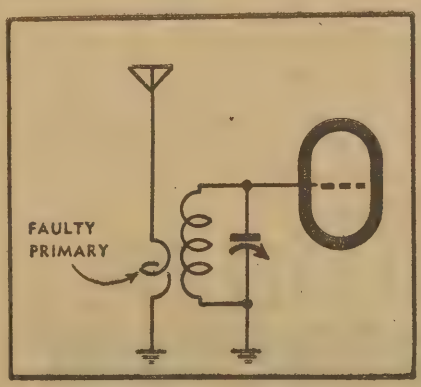
An intermittent heater or a bad

Photograph of the cracked valve.

socket connection to a heater pin will cause just this trouble, but there was no sign of any heaters changing their temperature. All were glowing a consistent bright red.

Then I noticed a strange reflection in the top of the 6U7-G I.F. amplifier valve. Closer inspection revealed it as a fine crack in the top of the glass dome, extending all the way round, but only about halfway through the glass. All except in one spot, where the crack appeared to be right through. Replacement with another valve cured the trouble.

Apparently, the crack had reached the infinitely delicate state where temperature changes were allowing a slight amount of gas to enter the envelope and affect the operation of the tube. At any tick of the clock, the crack could have opened up and the whole top of the valve lifted off. I have seen plenty of glass flaws and strains, but never one so delicate in its effect as this one. Incidentally, the valve showed normal transconductance.



Faulty primary on aerial coil.

Just in passing, it seems that cracks often develop around the dome in glass valves, near where the valve shield breaks contact with the glass. Apparently, the effect of heat on the top of the bulb and the cooling effect of the can on the sides of the envelope, aggravate glass strains and often cause the whole top of the envelope to lift out.

Valve manufacturers use polarised light beams to discover glass strains, but, inevitably, a few dubious envelopes get through.

FAULTY AERIAL COIL

I had an unusual case the other day. A quite modern set, which was given to strange noises and to variations in volume and background noise.

There was no sign of the trouble when I visited the house, so the set was brought back to the service shop for attention. It was switched on as a check while other work was proceeding. Sure enough, only a few minutes had passed when it began to exhibit the symptoms complained of.

Mainly because I was busy on the other job, I merely switched the set across to the short-wave position and tuned a station which happened to be on with a pleasant musical programme.

During the next half-hour, there was not the slightest suggestion of bother, so I tuned back to the broadcast band for a further check. Again came the noise.

Suspecting the wave change switch, I examined all contacts carefully, but they appeared to be in perfect shape. Likewise the trimmers and coil connections. Not finding any trouble, I wired a meter in the oscillator grid return and left the set playing while I went on with other work. Next time the trouble appeared I checked the grid current, but it was rock steady. Apparently, not in the oscillator section.

Another tube? Still the trouble! Well, let's connect the aerial through a condenser to the converter grid. This time the set was apparently OK.

Must be the aerial coil. So, the multimeter was connected across the aerial coil primary, on the low resistance range. There it was! Just a quiver of the needle pointer, but enough to show that the winding was faulty. So a new aerial coil and one more satisfied customer.

TRANSMITTER HINT

Though not concerned with transmitters on a professional basis I have fiddled with a few of them and know my way around transmitting circuits.

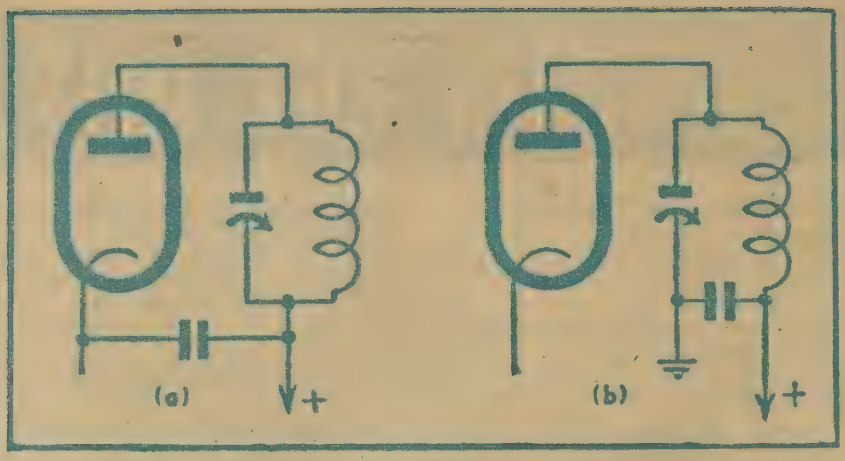


Diagram showing rewiring of 807 R.F. amplifier stage.

Last week I walked in on an amateur friend and found him perspiring over a 20-metre transmitter —a simple two-stage affair with a 6V6-G tritet and an 807 in the final. He had just reached the point where he was calling into question 807s in particular, beam tetrodes in general, and the family trees of all the gentry concerned in their design and production.

His problem was not an entirely novel one. The transmitter was tuned up in the usual way, giving a nice friendly glow in the monitor lamp suspended near the final tank coil. But whip out the crystal and instead of the lamp blacking out it glowed even more brightly. The 807 was merrily oscillating of its own accord.

"Have to neutralise the darned thing, after all," was my friend's comment.

Personally I didn't agree, because the valve makers say otherwise, and I know quite well that thousands of 807s are in use in straight circuits without neutralisation. I don't hold any shares in a valve company to prompt my remarks, but I do have a lot of respect for the ratings and data published by the manufacturers.

Indeed, it is hard to recall any product or device which is supported by such exhaustive research and application data.

Anyhow, I looked over my friend's transmitter and it seemed to be a model as far as layout was concerned. Nice short leads everywhere, valve on its side with grid and plate components separated, shield halfway up the tube and the approved grid choke and screen suppressor. All condensers in the right place and everything apparently just so-so.

Whether it be in an amplifier or transmitter, certain precautions should always be taken with 807 valves or, indeed, any other type with such high transconductance and power capabilities. The need for extra care in circuit and layout is one of the prices we have to pay for bigger and better valves.

HAND CAPACITY

On the surface there seemed to be no obvious reason for the instability, but I did notice one thing—the final tank tuning condenser exhibited a slight hand capacity effect. It was wired straight across the final tank coil and the rotors and frame were returned to chassis through a mica condenser.

It seemed suspicious, so I had my friend change the circuit around to ground the frame of the condenser solidly to the chassis, connecting the mica blocking condenser between the B-plus end of the final tank coil and the same earth point.

Presto! The hand capacity effect had disappeared and with it the instability. One could pull out the crystal and there was no sign of output from the 807.

Now, I am not suggesting by this that the former circuit should be avoided or that the change will always minimise the tendency to instability. The former circuit has certain points in its favor, notably the reduction in potential across the tuning and the RF bypass condenser.

But here was one case where the mica condenser did not effectively ground the plate tank tuning, and the net result was apparently incurable instability. So, hams, if you have similar trouble and other measures have failed, just check on this point and see whether it will solve your difficulty.

Incidentally, the value of the mica bypass condenser is limited by the fact that it has to have high reactance at audio frequencies, assuming that plate modulation is employed.

I did not charge for that job, my reward being a couple of very interesting QSOs and a very nice supper prepared by the XYL. It's an ill-wind. . . .

COMPONENT RATINGS

One of the things which help keep servicemen in business is over-running components. Resistors, condensers, valves are all likely victims of this form of false economy, and who am I that I should complain? The trouble is that most manufacturers will not play, and persist in doing their best to avoid breakdowns and service calls.

These remarks are prompted by an unfortunate case I had the other day. An ardent home builder had completed a big receiver rather like the recent "TRF Radiogram." He had spared no time and expense to make it a good job, and I must say that the result sounded very pleasing indeed. That was not the cause of his worry.

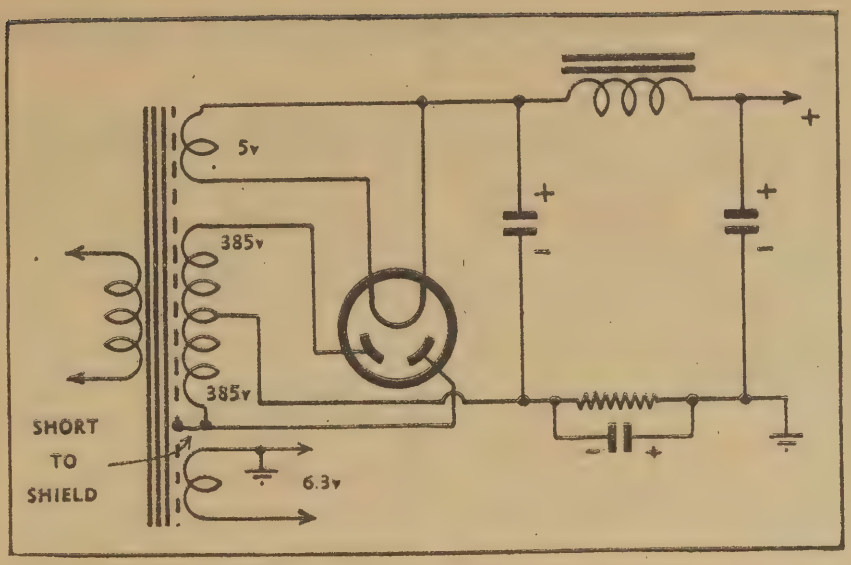
The only reason for me to come into the matter at all was to check up on the heating effect in the power transformer. He had been through the whole set many times without discovering anything wrong and he wanted a second opinion.

When I arrived on the scene the set was perched on top of the cabinet and had been playing a local station for best part of two hours. I put my hand on the power transformer and promptly took it away again, because it was just too hot to handle. A transformer is safe enough in most cases if it is simply hot to the touch, but this one was many degrees beyond that rather elastic definition.

HOT TRANSFORMER

As it was, the set was on top of the cabinet with virtually unlimited ventilation, and the day was rather coolish. Goodness only knows what it would have been like inside the cabinet on a hot day!

Naturally enough, I turned the chassis over and checked on the wiring. Everything was in order and the voltages appeared to be okay. When I checked the current it was dead on 100 milliamps. Officially the transformer was rated at 150 milliamps, which should have given an ample margin and allowed it to operate just comfortably warm.



Power transformer with shield shorted to core.

It seemed a clear case of a faulty unit, so I advised the owner to try for a replacement. When he did contact the supply house he was told that his complaint was no news to them and that the particular type was only handled because no other was available.

Actually he did locate another brand and had no further trouble, the temperature rise being quite moderate.

Just why the first transformer should have become so very hot I cannot say. Faulty design, poor materials, a shorted turn — any of these things could have been responsible for it and it is not my place to discover why. But it's a poor show for all concerned when an important item of equipment is overrun at two-thirds of its official rating.

(Continued on Page 64).

1948 PRICE LIST OF DISPOSALS PARTS

All new unless marked "U"

Block Condensers

6 mf 1000 volt 7/6
Postage 9d extra.

4 mf 600 volt 5/-
2 mf 400 volt 2/-
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1 mf 1000 volt 5/-
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.1 mf 6000 volt 2/-
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Small black instrument type 1/-
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Heavy duty shielded connectors, complete 2, 4 or 6 conductor .. 5/-
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The above sent by rail freight on in N.S.W. only.

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Navy 3200 ohms magnetic type 21/-
Complete with band and cords.
Postage 1/- extra.

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Postage 1/3 extra.

Magnetic low impedance type 7/6
Also limited quantity of used low impedance phones 5/-
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Balanced armature magnetic phones with microphone require no transformer 22/6
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Ferranti, 0-150 mA. Projecting type 25/-
Postage and packing 1/- extra.

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Navy carbon hand microphone 10/-
Postage 1/- extra.

Dynamic microphone hand type, 45 ohms impedance "U" 10/-
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Army No. 3 carbon hand microphone 7/6
Limited stocks of used No. 3 microphones 5/-
Postage 1/- extra.

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Dynamic microphone inserts 5/-
Postage 6d extra.

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Navy double button carbon microphones 7/6
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Caps for dynamic or carbon microphones 6d
Postage 3½d extra.

Potentiometers

Short shaft for preset controls, in 500, 1000, 20000, 25000, 50000 and 100000 ohms 1/6
Postage 3½d extra.

Resistors & Condrs.

A real bargain. Packets containing ½lb. weight of mixed carbon resistors and mica condensers. Posted anywhere in Australia for 2/6

Rectifiers

(Dry, metal type).

Midget Selenium half wave 2/-
Postage 2½d extra.

48 volt 100 mA Selenium 3/6
48 volt 100 mA Copperoxide 3/6
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Relays

P.M.G. type, available with the following resistances:—
200, 250, 500 and 5000 ohms 7/6
Postage 6d extra.

A.W.A. type 12 volt DP.ST 15/-
Large contacts fully enclosed.
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Sets, etc.

No. 11 Chassis only, less meter and valves "U" 50/-
English I.F.F. with valves, contains hundreds of useful parts 70/-
The above sets forwarded rail freight on in N.S.W. only.

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Lucas type Signal Lamps complete in case with spares 17/6
Forwarded per rail. Freight on in N.S.W. only.
Spare globes for Aldis Signal Lamps each 1/-
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50 ohms—85 watt .. .. each 1/6
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Postage 6d each extra.

Sundries

Telephone jacks "U" 6d
Telephone plugs, No. 9, "U" 6d
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Postage 2½d extra.

Telephone relay panels with rectifier, etc. 5/-
Postage 1/3 extra.

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We have a few sets of Don 5 telephones in very good order .. each 50/-
Forwarded by rail freight on in N.S.W. only.

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Microphone caps for hand set 1/6
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Receiver inserts for hand set 2/-
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4-way cords, approx. 4ft. long 6d

Valve Sockets

Ceramic in 4, 5, large 7 & octal only 2/-
Postage 2½d extra.

Valves

(All fully guaranteed).

EF50—U.H.F. Pentode 10/-
EA50—U.H.F. Diode 7/6
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Packing and postage 1/- extra.

Variable Condensers

British 400 mmF condensers with ceramic insulation 8/6
Ideal for all small sets.
Postage 9d extra.

Vibrators

Gas filled 6 V. with octal base 8/6
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Wires & Cables

Heavy duty twin microphone cable, shielded and rubber covered, yard 1/-
5 conductor, rubber covered battery speaker leads, 4ft. lengths only, ea. 6d
2 conductor, rubber covered leads for microphones, etc., approx. 4ft. long 6d
Postage extra.

PRICE'S RADIO

5 and 6 Angel Place, Sydney

A 5-INCH OSCILLOSCOPE

(Continued from Page 38)

circuit; the heaters light up immediately the power is switched on at the power point. Since both the focus and the intensity potentiometers carry a high negative potential, they should be mounted and insulated on angle brackets well back from the front panel and provided with insulated extension spindles carrying the control knobs.

The arrangement of terminals on the front panel differs from that on the 3-inch oscilloscope, mainly because we have had in mind here to provide ultimately for push-pull deflection. There are four terminals along each side of the panel, with two set inwards from the upper one.

On the left hand side of the panel, the top outer terminal connects to deflector plate Y1, while the top inner terminal connects to plate Y2, hese plates being for vertical deflection.

On the opposite side of the panel, he top inner terminal is for the X2 plate, while the outer terminal is for he X1 plate, these plates being for horizontal deflection.

PLATE CONNECTIONS

The fact that both sets of plates are brought out to the front panel makes it possible to use the instrument in its present form with push-pull deflection from large amplitude signals applied direct to the plates.

However, for normal use with the amplifiers, the Y2 and X2 plates are linked across to the two upper central terminals, which are earthed in this present version. Thus, the coupling condensers to plates Y2 and X2 become, in effect, bypass condensers to earth—a very necessary item if the plates are not tied directly to the anode.

As far as d-c is concerned, the two plates are returned through 2 meg isolating resistors to the spot shift controls, operating across the positive voltage supply. The Y1 and X1 plates are returned to a potential about 200 volts positive through 2 meg isolating resistors.

The terminal immediately below the Y1 plate carries the output from the vertical amplifier so that these two are normally bridged across. Underneath that again is the input to the vertical amplifier and lastly, an earth terminal.

CONTROLS

On the right hand side, the two lower terminals are for earth and input to the horizontal amplifier. Number three from the bottom carries the output from the time base and is normally bridged across to the "amplifier input" terminal immediately below it. The output from the horizontal amplifier is connected permanently to the X1 plate within the instrument.

The toggle switch immediately below the C.R. tube, is for internal and external synchronisation. The control to the right is the coarse sweep frequency switch, while the fine frequency control is to the left.

Along the bottom of the panel is the vertical gain control, the synchronisation amplitude control and the horizontal gain control. The terminals in between are a 50 cycle output on the left and external synchronisation input on the right.

In laying out the chassis, provision was made for additional valves, so that, in the present version, there are several blank valve holes. The voltage amplifiers are mounted centrally on the chassis, one to either side, while the rectifiers are to the rear of the chassis. The gas triode is on the right, just in front of the horizontal amplifier.

PLATE WIRING

In wiring the instrument, we found it of great assistance to mount the majority of the resistors on a panel down the centre of the chassis. It is a good plan to group the components for each individual amplifier and those for the time base valve, the odd spaces being given to the divider network resistors, which constitute essentially a d-c circuit.

It is a good plan to run the horizontal deflector plate leads in stiff insulated busbar above the chassis, running them down to the terminals and associated wiring through holes just behind the panel. In fact, a few of the wiring components were likewise mounted above the chassis.

If the deflector plate leads are run indiscriminately close together and alongside other wiring, there is a chance that unwanted pickup will occur.

Last but not least, there is the matter of hum pickup from the transformer. In the normal way this will be manifest by an initial deflection of the spot into an 1-8th inch to ¼ inch line, irrespective of amplifier settings. You can verify the effect by switching off the power and watching the spot closely immediately afterwards. If the line contracts to a spot as it fades out, it is fairly certain that you are up against magnetic deflection troubles.

The suggested chassis is deep enough to accommodate the power transformer underneath. Some reduction in magnetic deflection can sometimes be achieved by carefully selecting the mounting position of the transformer. This will involve connecting the transformer into circuit by long leads and trying out various positions with due care not to short circuit any windings — or yourself.

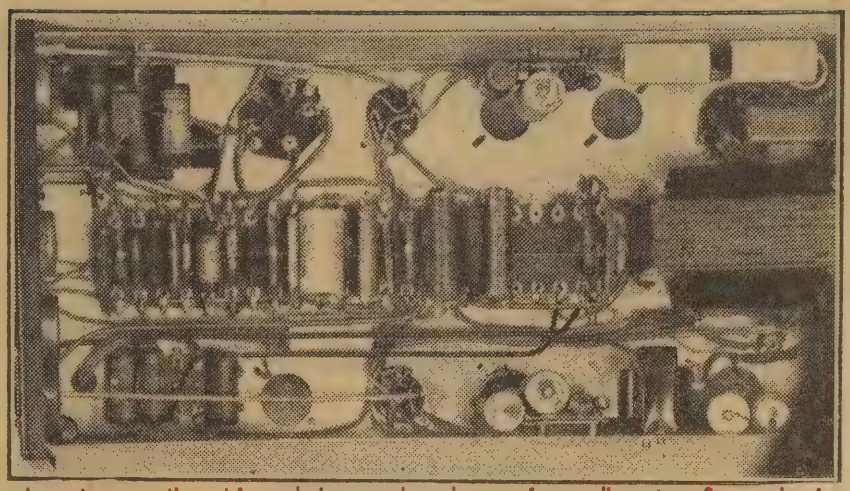
It is unlikely that rotating the transformer will eliminate magnetic effects altogether, and the next approach is to try shielding of the tube itself. The ideal is a mu-metal shield from surplus radar gear. Or you may be able to locate some scraps of mu-metal to bend into a shield.

TUBE SHIELDING

Failing that, a length of heavy water pipe, around the neck of the tube will help, provided it is supported independently of the glass. There is no hard and fast rule about all this. Simply a "the more the merrier" as far as shielding is concerned. You can assume that you have achieved success if the spot can be focused down to about the area of a pin head. Better than this is difficult to achieve without more elaborate precautions.

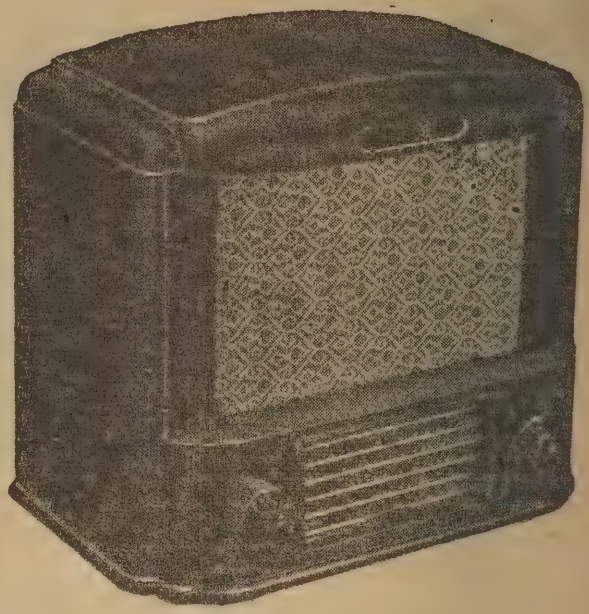
In our next issue we hope to describe a more elaborate version of this oscilloscope, incorporating push-pull deflection amplifiers and an improved time base. In this form, it should compare in performance with a first-class job suitable for laboratory work. The refinements to be described are additions, and none of the components used here will be discarded or replaced. Unless you are experienced in CRO construction, you would be well advised to build the one described here for a start, expanding it according to next month's design if and when you wish.

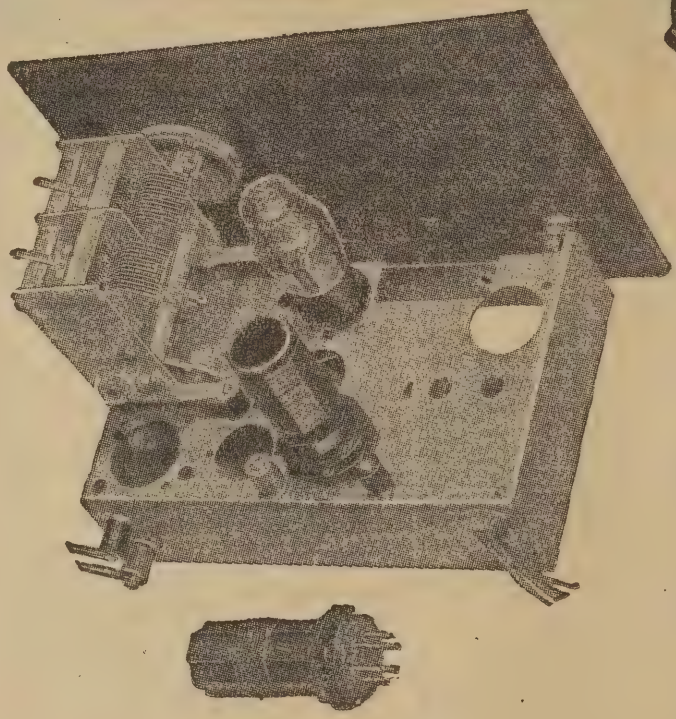
UNDER CHASSIS VIEW OF 'SCOPE



A centre mounting strip makes a good anchorage for small parts. Spare chassis holes will ultimately accommodate extra valves for a more elaborate circuit.

HOW TO BECOME A RADIO EXPERIMENTER





Radio enthusiasts and students—

Here are two Easy-to-Build Kits.

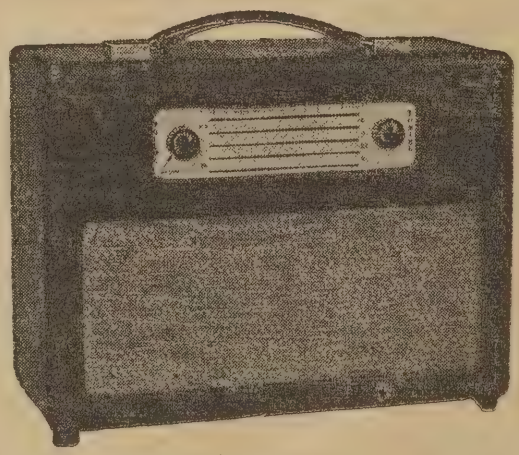
★ **Triple wave A.C.—3-valver (above)**

★ **1-valve experimental Battery Kit (at left)**

Two kits specially designed for the beginner. This 3-valve kit comes to you ready assembled with only a few simple connections. The 16-page instruction booklet supplied with every kit not only teaches you how to build the set, but it explains the function of all parts and is most instructive.

Price, complete with ALL parts, £12. Post Free. Also available in same plastic cabinet are various kits for the more ambitious experimenter. They are:—4-valve A.C. Broadcast, 4-valve Battery Broadcast, and 4-valve Vibrator. Full details of these kits, and prices of kits to suit all "Radio and Hobbies" circuits, are available upon request.

Designed specially for those starting experimental work, the one-valve Electronic Parts kit set (left) is battery operated and designed for both broadcast and short wave reception. An ideal "first set," you can now experience the thrill of logging near and distant radio stations on a set built entirely by yourself. Full details of coil winding, how to mount the parts, method of wiring, etc., given with every kit. This set uses a standard 4-valve chassis, 2 gang condenser, and modern dial which can be used in bigger circuits if you wish to build them later on. It comes to you complete with valve, all material necessary to build the set and wire the coils, headphones, batteries, and everything right down to the last nut and bolt, for the exceedingly low price of £6/18/-. Postage extra.



Outstanding "University" PK4X Portable

The first portable kit with a loop aerial built right into the cabinet, this brilliant new PK4X kit includes all parts necessary for construction. The ultra-modern 4-valve design employs the latest bantam type valves and mini-max type batteries. The kit is already assembled and an instruction book clearly shows the simple wiring. Price including tax £16/19/6. Postage extra.

ELECTRONIC PARTS PTY. LTD.

E. S. and A. Bank Building,
BROADWAY, N.S.W.,
Phone: MA 1661.

WHOLESALE DISTRIBUTORS OF EVERYTHING IN RADIO

PICTURE NEWS OF THE WORLD'S SKYWAYS

Atom Power Engine

ACCORDING to Major-General Curtiss le May, Deputy Chief of the US Air Staff in charge of research and development, the US expects to be able to develop an atomic powered aircraft engine requiring no chemical fuels to run it.

Le May added that many more months of research are required for the development, but said: "We are confident that such a nuclear engine when we get it will open up new fields of performance and range of our aircraft."

★ ★ ★

Yellow Cabs Fly

THE Yellow Cab Company of Cleveland Inc. has been authorised by the Civil Aeronautic Board to engage immediately in the transportation of passengers and cargo for a three-year period.

Yellow Cab thus becomes the first helicopter operators certificated by the CAB to carry passengers.

★ ★ ★

England is establishing at Bedford, a new £25,000,000 research station, the Aeronautical Establishment, which will be one of the world's best equipped air research stations.

★ ★ ★

Russian Air Power

RUSSIA now has 14,000 first-line combat planes, about three times the numerical strength of combined US Air Force and Naval Air Service, according to General Carl A. Spaatz, US Army Air Force Chief of Staff.

He declined to comment on the quality of the Soviet first-line planes, but said that more than 100 jet planes of several different types participated in last year's May Day celebrations in Moscow.

Spaatz credited the Russians with the capacity to build from 500 to 1000 B29s since the plane fell into their hands via a forced landing in Siberia in 1944.

Spaatz also confirmed rumors long prevalent in aviation circles that the Russians had unsuccessfully attempted to buy tyres, brakes and wheels, required for B29s, from an American rubber company.

★ ★ ★

Short Bros. Ltd., flew Britain's largest flying-boat, the Shetland, one day after its launching.

The aircraft is powered by four 2500 hp Bristol Centaurus engines and is designed for long-range usuage.

The double deck fuselage will be outfitted in the usual luxurious British manner to receive 70 passengers, plus a crew of 11.

★ ★ ★

New "Personal"

ESSEX AERO LTD. of America is developing a two-place, low-wing personal plane which is to have a noise level comparable with that of a passenger automobile.

Another feature will be a magnesium alloy construction of all parts except the control surfaces.

Cruising speed will be around 130 miles an hour and maximum range 750 miles.

★ ★ ★

Convair Records

THE Convair XB40 four-jet bomber set new multi-engine speed records during its delivery flight to Wright Field for detailed performance tests following USAAF acceptance of the plane a month ago.

The bomber averaged 507 mph on its 2hr. 15min. first-leg flight from Muroc Air Base, California, to Tinker Field, Ohla.

The following day it averaged 533 mph on the Oklahoma City-Wright Field, Dayton, Ohio flight, covering the 800 miles in 1hr. 40min.

Captain Glen W. Edwards, USAAF pilot, said he made no attempt to set any records and was surprised to learn he had neared jet-fighter mark upon landing at Oklahoma City.

The craft will undergo routine flight tests at Wright Field to determine its suitability as an Air Force tactical type.

★ ★ ★

Fast Skyrocket

THE Douglas Aircraft Company recently revealed its new sonic research plane, the "Skyrocket" (D558-2).

The Skyrocket's design differs radically from its original layout as a modified version of the "Skystreak" (D558-1).

The needle-nose, swept-back-wing craft has emerged from the Douglas factory as an entirely new concept in high speed flight incorporating all known ingredients for sonic speed, many recently revealed by intensive wind-tunnel research work.

The Skyrocket combines rocket power of the Bell XS-1 with the turbojet power of the Chance Vought Pirate, incorporating swept wings of low aspect ratio and a swept tail.

It has a tactical thrust power of 9000 pounds. It is 45ft. 3in. in length and stands 11ft. 6in. in height.

The wing span is 25ft.

★ ★ ★

The Airspeed Ambassador now in flight test and displayed at Radlett, England, last month, is powered by two 2600 hp Bristol Centaurus engines, seats 40 passengers and cruises at 230 miles per hour; range is 1000 miles.

★ ★ ★

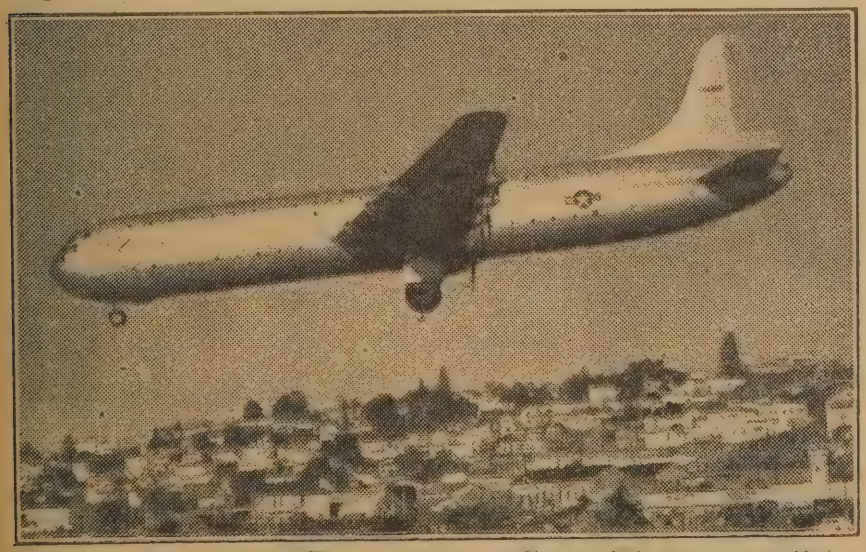
Convair Performance

BASED on material developed during 16 weeks testing programme at the end of which the Civil Aeronautics Administration granted Approved Type Certificate 793 for the Convair-Liner with 1975 hp engines, Consolidated Vultee Aircraft Corporation recently released a preliminary report covering weights, payloads, range and performance of the airplane with 2400 hp engines.

The report indicates that the Convair-Liner's take-off gross weight of 39,500 pounds will be increased to 40,500 pounds following engineering studies now in progress.

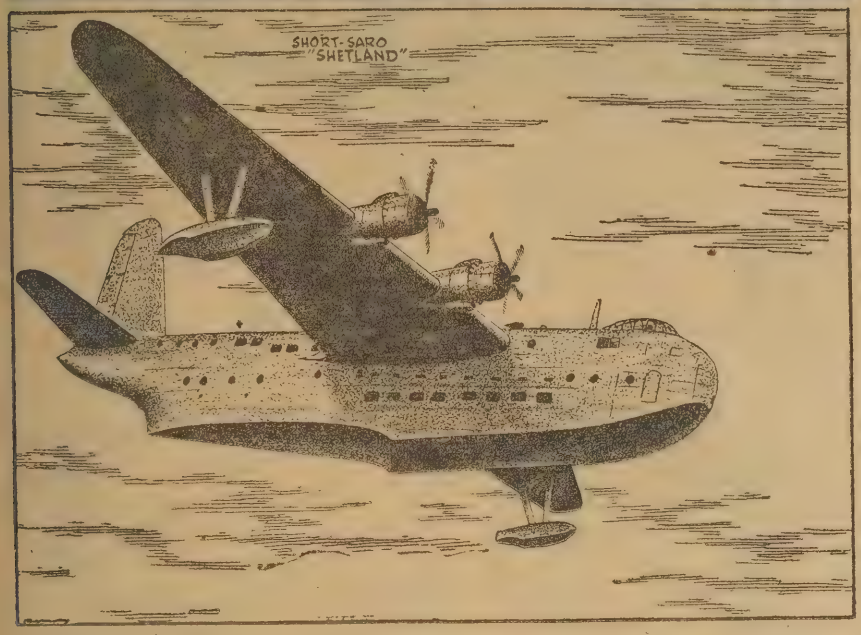
Using Pratt and Whitney R2800-CA18 engines with water injection and cruising at 16,000ft., the Convair-Liner's new estimated maximum range is 1090 miles at 67 per cent. power, with ATA reserve of 200 miles, plus 45 minutes' fuel.

Trans-Australian Airlines has ordered five of the new airliners and they are expected to reach Australia early this month for immediate service.



Coming in for a landing following its first test flight recently is the Convair XC-99, world's largest land plane. After a take-off run of only 3,000 feet, the XC-99 lifted easily into the air for a one-hour flight. Following several months of testing, the six engine transport will be delivered to the US Air Force.

BRITAIN'S LARGEST FLYING BOAT



Officially announced in May 1944, the great Short - Saro Shetland flying-boat recently undertook a trial flight after its successful launch. Twice as heavy as anything yet constructed in Britain, the Shetland has been designed by the UK Government for "long-range research and development."

THE flying-boat, built by Short Brothers, at Rochester, is the second prototype. The first prototype (a military version). constructed during the war, caught fire and burnt out at its moorings.

With an all-up weight of 130,000lb., the Shetland provides accommodation for 70 passengers and a crew of 11.

The sketch, showing the aircraft as seen in flight from below, illustrates the great depth of the hull and its streamlining.

The aircraft is 110ft. long and has a wingspan of 150ft., and is powered by four 2500-horse-power Bristol Centaurus air-cooled 18-cylinder engines, which give it a maximum speed of 267 miles an hour.

At a cruising speed of 184 miles an hour, the Shetland's range is 4650 miles.

The general lay-out follows conventional flying-boat design. The two-step hull sweeps up to a tail unit consisting of a tall, single tail-fin and rudder and a tail-plane showing very slight dihedral. Fixed wing-floats are fitted.

Full capacity is 6000 gallons, in addition to 320 gallons of oil. The machine is capable of flying non-stop from London to Bombay.

The interior arrangement of the flying-boat provides two decks, with a long central corridor, with steps leading up to the cockpit, which is located in a "glasshouse" placed on the top of the fuselage well forward.

It is interesting to recall that although, at the outbreak of war in 1939, work was proceeding on the development of long-range landplanes for British trans-ocean air services, the Empire air-mail scheme and consequent expansion of Imperial air networks relied primarily upon the use of the large flying-boat.

British experts have pointed out that, while there are certain bases in the United Kingdom and the distance that many of these are from London, a number of advantages justifies further investigation of the claims of this type of aircraft.

"It offers better scope for the development of very large types, since it gains in relation to the landplane, both as to aerodynamic efficiency and as to structure weight, as the size increases," one expert says.

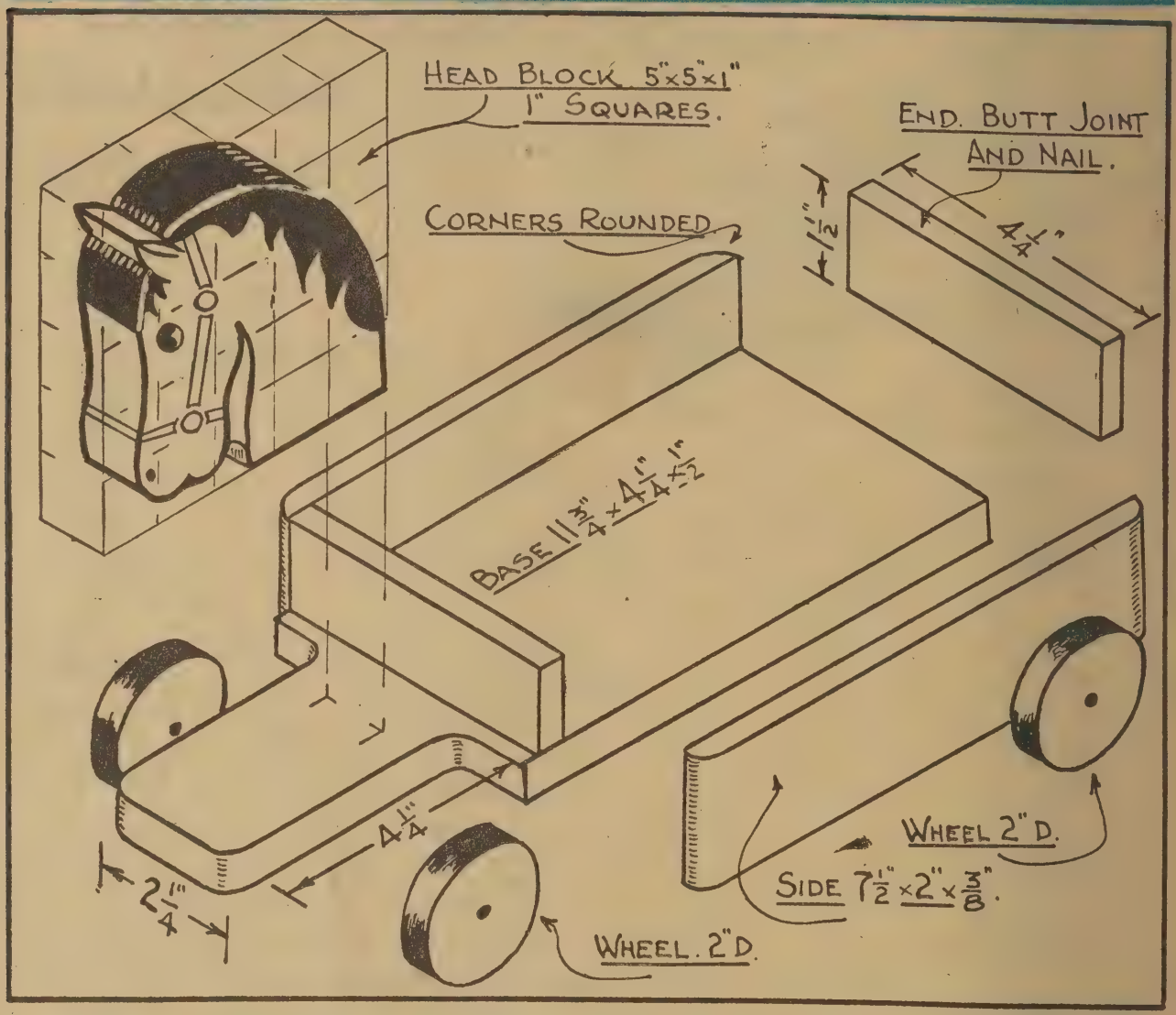
He adds: "When this occurs the ratio of profile drag to weight tends to improve, and this is particularly the case with the flying-boat."

One important factor is that, whereas with landplanes increased size accentuates difficulties of providing suitable airfields and designing satisfactory and reasonably light undercarriages, in the case of flying-boats, as size increases the seaworthiness and operational qualities improve.

The flying-boat's ability to operate from a ready-made surface gives this type of machine an advantage over the aeroplane, use of which involves the preparation of ground facilities. The longer take-off practicable means that for a given power plant the flying-boat can have a somewhat higher all-up weight and a higher initial wing-loading.

This leads to high load capacity over long stages. The wing-loading of a flying-boat at landing can also be higher than that of its landplane equivalent, a factor which makes fuel and payload more readily interchangeable according to the work upon which the machine is engaged.

AN EASY TRAILER HORSE AND CART



Simple to make but effective in use, Baby will get plenty of thrills in guiding this Horse-Cart around the playground. The drawings are almost self-explanatory, so little time will be spent here on description.

FOR the base a piece of wood 12" x 4¼" x ½" is needed. Make this to the shape as shown by cutting from the two corners rectangular pieces 4¼" x 1". Round the corners nicely where shown. The sides are of ⅜" wood, 7½" long and 2" wide. Round the edges of these and glue and nail on the base.

Measure the length required for the two ends (they should be about 4¼") and cut them from a piece of 1½" wide stuff. Square up the edges and fasten the wood in place with panel pins through the sides and the base. Plane the top level and smooth up with sandpaper.

Set out the head on a block of wood 5" x 5" x 1". Mark it out in 1" squares and copy the shape shown in the diagram. Carefully saw it to shape and after smoothing up any rough parts, glue and nail it to the base where indicated. Four wooden wheels 2" in diameter are screwed in place where shown.

Bright colors are needed when painting. The suggestion is to use red for the wheels, blue for the cart, and after painting the head yellow, pick out the details of mane and harness with red and black where required.

VALVES AND THEIR CONNECTIONS

(Continued from Page 40)

has four elements and a pentode five. With the filament and plate connections assumed, this leaves two and three grids respectively to be sorted out. Counting from the cathode on the circuit diagram, the first grid is always the control grid, the second is the screen and, in the case of the pentode valve, the next grid is the suppressor. Some of the modern tetrodes, by virtue of their special beam construction, do not require a suppressor grid.

The grids are usually abbreviated CG, SC and SUPP. respectively.

Many RF pentodes and tetrodes have the control grid brought out to a cap on the top of the valve. Some European types have a top cap connection to plate, while the latest single-ended types have both plate and grid brought out to base pins. It is thus impossible to give any general rule about the matter.

Comets Wander Through Space

(Continued from Page 9)

stars beyond the comet are visible through it. This suggests that the comet is of gaseous nature. The nucleus may consist of millions of meteoric fragments, for, although very large, the mass of the nucleus is small. Color is lent to this conjecture also by the fact that comets and meteors follow one another in similar orbits. The spectroscope shows a similarity between comets and meteors.

In size, the nucleus may measure a mere 100 miles to the size of the earth, but the head or coma may extend from 10,000 to 100,000 miles or more.

THE COMET'S TAIL

The tail of the comet exhibits some special peculiarities for not only does it vary in length, but it may at times alter its shape. The tail of the comet appears at its greatest when the comet is nearest the sun. It would appear that the sun has a vast influence on the gaseous matter of which the tail is supposed to consist, for it is a peculiar fact that the tail of a comet always points in a direction away from the sun, but when the comet has left the vicinity of the sun the tail goes BEFORE the comet. It is also known that the tail only appears when the comet is near the sun, so that this body not only drives the tail from the body of the comet, but also forces the tail to the side opposite the sun.

One likely theory for this behavior is that the sun is charged with negative particles of electricity, which drives out from the comet's head larger particles similarly charged with negative electricity. This forms the tail and accounts for its peculiar behavior.

ORBIT LENGTH

The length of a comet's tail is enormous, being measured in millions of miles even at its shortest. Some idea of the rarity of the composition of a comet is gathered from the fact that even with such a prodigious size the quantity of matter present has been calculated to be no more than one five thousandth part of that of the earth.

The length of the comet's orbit may be visualised by the fact that one observation of a large comet shows it to travel to a distance of 40,121,000,000 miles from the sun. At its nearest point it was as close as 32,000 miles from the sun, so that only a small change was required in its direction for it to have caused a collision. The sun's influence on our earth at a distance of 93,000,000 of miles is very great. How much greater must that influence be on a flimsy object like a comet at a distance of 32,000 miles.

It appears that most of the comets

(Continued on Page 64).

SHORT WAVE NOTES BY RAY SIMPSON

B.B.C. CHANGES PACIFIC SERVICE

LATIN AMERICANS ON 6mc BAND

The Pacific Service of the B.B.C. has been in operation for a very long time now and everyone in Australia and New Zealand has become very used to its timing, etc. It was therefore somewhat of a surprise to find that at the end of December a new schedule was to be taken into operation

AT this time it would appear that the following are the new arrangements and as we know these stations are of interest to a great number of our readers we give all the details we have.

The Pacific Service terminated on December 27, 1947, and from the following day a new service called the Pacific Regional Service came into operation. This new service is on the air daily from 4.0 pm till 5.45 pm, 1¾ hours instead of 4 hours as before.

The General Overseas Service beamed to Australasia will be broadcast from 4 pm to 10 pm. The Pacific Service will be on GVZ, GRX, GSN, GRD, and GSG throughout while the General Overseas Service will be radiated on GST from 4 pm to 8 pm, GSV from 8 pm to 10 pm. GSH from 8 pm to 10 pm, GRA from 6 pm to 8 pm, GSV from 8 pm to 10 pm, and GSN from 9 pm to 10 pm. All these transmitters are being heard at very good strength just now at most locations.

NEW PORTUGUESE CALLS

PORTUGAL.—We learn from the latest issue of the Universalite that call letters have now been assigned to the various stations of Emissora Nacional in Lisbon. A full list of these calls are as follows: CS2MA 6.374 mc., CS2MB 7.26 mc., CS2MC 9.635 mc., CS2MD 9.67 mc., CS2ME 9.68 mc., CS2MF 9.727 mc., CS2MH 9.74 mc., CS2MI 9.94 mc., CS2MK 11.027 mc., CS2ML 11.04 mc., CS2MM 11.84 mc., CS2MO 11.995 mc., CS2MP 12.749 mc., CS2MQ 15.1 mc., CS2MR 15.11 mc., CS2MS 15.12 mc., CS2MT 15.32 mc. Another station controlled by the National authorities, located in the Azores and which has always been referred to as Ponta Delgado has now been given the call letters CS9MD.

PALESTINE. — The various stations located in Jaffa, which up to the present have always been known by their title of Asharq al Adna, have now been allotted call letters, according to Swedish reports as given in the "Universalite." Call letters always seem so much more definite, we think, so you can now show on your lists the following calls for these stations: ZJM3 3.32 mc., ZJM4 6.135 mc., ZJM5 6.17 mc., ZJM6 6.79 mc., and ZJM7 11.72 mc. While speaking of this country readers will probably have noticed the improved signal being obtained from JCKW in Jerusalem, which operates on 7.22 mc. At our location this station is very good indeed at 6 am.

HAVE YOU NOTICED? Warsaw has now changed frequency from 6.1 mc. to 6.225 mc. and has news in English at 7 am; that the Czechoslovakian stations are now only using OLR2A on 6.01 mc., Munich has now opened a channel on 6.1 mc. and can be heard here well at 6 am; the improved signal from the Cuban stations at night; the additional BBC station on the 26 mc. band, GSS on 26.55 mc.; Singapore on any new frequencies—they are supposed to make a change in January; the new station on 6.1 mc. at night which seems to be in the Philippines as Cebu is frequently mentioned; that Rangoon has changed frequency from 6.04 mc. to about 6.05 mc. and is now on the high side of Hanoi.

MC INSTEAD OF KC

READERS will notice that in this issue all frequencies are given in megacycles instead of kilocycles and this method will be continued in the future. With the increasing trend to higher frequencies the practice of expressing frequency in kc is becoming a little cumbersome and by the use of mc the actual bracket of figures will be smaller and also save a few lines of print.

We are very pleased to note that nearly all listeners have now discarded the quoting of metres when referring to stations as this is a very out-dated practice and not nearly as accurate as giving the frequency.

SHORT WAVE NOTES for the March issue are due on February 6th. For the April issue they are due on March 5th. Please send them direct to Mr. Ray Simpson, 80 Wilga Street, Concord West, NSW.

DX CONTEST

THE closing date of our DX Contest is fast approaching and we can imagine many of you are now anxiously watching the postman to see if he brings along those wanted verifications to swell the grand total and thus bring the reward for all the careful listening and reporting.

We have had some interim reports from various readers as to their expected totals and at this stage it looks as if the senior stage may be quite a close finish, which will be very exciting. It may not be possible to give the result in the March issue but if not it will certainly be given in the April issue of "Radio and Hobbies."

STATION ADDRESSES

OAX4J—Radio Colonial, PO Box 1166, Lima, Peru.

OAX4W-V—Radio America, Casilla 1192, Lima, Peru.

ZBW3—Hongkong Broadcasting Studio, 2nd Floor, Gloucester Bldg., Hongkong.

ZAA—Drejtorija Qondróre e Radioperhapjes Shqiptare, Rue Conference de Peza 3, Tirana, Albania.

XEWW—Radioemissora XEWW, Apartado 2516, Ayuntiamento 54, Mexico City, Mexico.

TIRCC—Accion Catolica, Apartado 1064, San Jose, Costa Rica.

VUC—All India Radio, 1 Garstin Place, Calcutta, India.

Noumea—Le Chef du Cabinet du Gouverneu, Charge du Controle du Service de l'information, Noumea, New Caledonia.

KZRH—Voice of the Philippines, Insular Life Building, Manila, Philippine Is.

VLH/VLR—National Broadcasting Service, Box 1686, GPO, Melbourne, Vic.

FLASHES FROM EVERYWHERE

SUMATRA.—Listeners will remember the station we listed recently as Fort de Kock and which was heard transmitting on 7.2 mc. We have now received two interesting letters from Dutch listeners giving us further details of these stations. One of these gentlemen, Mr. P. J. Schoon, of Dunedin, NZ, writes as follows: This station is controlled by the Indonesian Republican Government and therefore broadcasts mainly in Malay. The Dutch tongue will, or may have been used in propaganda broadcasts only.

Fort de Kock, a small town on the west coast of Sumatra, was named after a Dutch general of the early colonial days. However, since the Japanese occupation and the inception of the Indonesian Republic, Dutch geographical names were replaced by Indonesian ones. Whereas the Dutch are maintaining prewar names. This is the reason the station referred to will not announce its location as Fort de Kock but as Boekit Tinggi (pronounced Bukit Tingi). Postal communication with this town will be uncertain at the present time and presumably for some to come.

Mr. A. Bles, of Broken Hill, NSW, tells us that a station has been in operation there since May, 1946, starting around 7.5 mc. where it interfered with an Allied network station operating in Palembang. They shifted their station's frequency to 7.2 mc. and have probably settled there now. Our thanks are due to both these readers for their help in the above matter.

SPAIN.—According to an announcement on the DX session from Radio Australia there is an undercover station purporting to be the Spanish Freedom Station and using the title "Radio Espana Independiente, Estacion Pyrenaica," and said to be transmitting from somewhere in the Pyrenees.

Times on the air and frequencies were stated to be 1.30 am to 2 am on 15.39 mc. and 11.64 mc., 2.30 am to 3 am on 17.69 mc. and 15.4 mc., 6.30 am to 6.45 am on 15.4 mc. and 10.28 mc., and 7.30 am to 7.45 am on 11.64 mc. and 10.3 mc. So far we have had no reports on this station and it has not been audible on any of these frequencies at our location.

COLOMBIA.—In a very interesting air letter received from the well-known Californian listener, Paul Dilg, we learn that Colombia is installing new and powerful transmitters to handle the broadcasting of the January conference of the Pan-American Conference and will transmit in French, English and Portuguese.

At the time of writing we have not noticed any of these new stations but perhaps during the month they may appear on some of the bands. We asked Paul if he could identify a Latin American we were hearing on 9.905 mc. and he says it could possibly be HJAP in Cartagena, which has moved to 9.897 mc. and is relaying HJAR, which is the broadcast band station on 1400 kc.

GERMANY.—We are indebted to Mr. Graham Hutchins, of Radio Australia, for information regarding a new station which has recently commenced operations in Germany. This station is operated by the Danish Brigade Troop and is called the Danish Brigade Radio. It operates on a frequency of 6.225 mc. from 5 am to 6 am. Announcements are in Danish and sometimes English is also used.

According to Mr. Hutchins' informant, a Swedish listener, the power in use at present is 90 watts, but this will soon be increased to 400 watts. Listeners should watch out for this one as on their higher power they should be audible in this country.

RECENT VERIFICATIONS

VPO3, BARBADOS. Readers will remember the new station we reported in last month's issue, VPO3 in Bridgetown, Barbados. Just after we went to press we received a very interesting letter of verification by air mail, which incidentally cost 5/4 postage.

The deputy engineer, Mr. J. H. Insall, in verifying our report, stated that at the time we heard the station they were transmitting a race meeting to Trinidad over VPO3 on 10,605kc. He also enclosed some interesting photographs of the station and advised that other outlets were VPO2 on 15.425mc., VPO8 on 19.055mc., VPO7 on 19.79mc., and VPO23 on 20.885mc. He also stated that they were now installing equipment for relaying pictures to Australia.

XECC, MEXICO. In rather good time for a Mexican station, we have received a nice letter of verification from XECC, which is located in Peubla and operates on 6.185mc. The letter was in Spanish and signed by the station manager Senor Angel Valera. This gentleman was very effusive in his thanks for the report and returned our Reply Coupon, saying it was not required.

Further reports were asked for and the address of the station was given as Radiodifusora, XECC, c/o Estacion XECD, Apartado No. 60, 2 Norte No. 803, Ciudad de Puebla, Mexico. Listeners should try for this station as they will definitely verify reports we would say, and quite likely by air mail.

XLRA, CHINA. Congratulations to our Western Australian reporter, Mr. George Major on receiving his verification from XLRA in Hankow. His report was the first they had received from Australia and he remarked that on the envelope there were 31 stamps for postage. (This beats ours, George, as we only had 27).

XLRA, which operates on 11.5mc., advised that they would appreciate further reports on their station which should be sent to the Hankow Broadcasting Station, XLRA, 168 Sheng-Li-street, Hankow, China. This station uses a power of 1kw. and is on the air from 7 am till 11.30 pm Hankow time, which is eight hours ahead of GMT. George sent us a full list of a typical day's programme, but it is too extensive to give here, unfortunately.

HS8PD, SIAM. Amongst a very fine bunch of verifications received by Mr. C. W. Jones, was one from HS8PD, which took the shape of a card printed in yellow and bearing the insignia and colors of the nation, a map of Siam, a view of the memorial of Democracy, radio towers, &c. This is indeed a very colorful card and well worth going after.

This card was signed by Nai Witt Siwasariyanon, and the address was given as Publicity Department, Overseas Broadcasting Station HS8PD, Bankok, Siam. This station has been varying in frequency lately, but is usually around 5.99mc. though on some occasions we have heard it on about 6.005mc. English can be heard between 9 pm and 9.30 pm.

ZFY, BRITISH GUIANA. Another very fine verification received by the same reader is one from ZFY in Georgetown, British Guiana which, of course, is in South America. This verie was also a card, and in addition to the usual verification details had the call letters VP3MR and VP3BG on it. As far as we remember, these latter two calls were used for two of the original stations in British Guiana before they were given the calls commencing with Z.

We may be wrong in this regard, and anyone who can advise Mr. Jones should get in touch with him direct at 24 Wharf-road, Gladesville, NSW. The frequency of ZFY is 6mc. and is on the air at 9 nightly, though personally we have never been able to hear this station.

ZBW3, HONGKONG. For some reason unknown, the Hongkong short-wave station is very reluctant, or at least very slow in answering reports from listeners. In this regard the writer has sent them three different reports giving details of reception of their changes in frequency in the 31 metres band—no reply has been received for any of these letters.

It is therefore pleasing to note that at least one listener has received an answer, this being Mr. Jones, of Gladesville, NSW, who received a letter confirming his report and also the schedule of their programmes. Their English transmission is from 11 pm till 1 am, though they are always rather difficult to log.

NEW STATIONS OF THE MONTH

number of new outlets by the various stations in the USA. At the time of writing the following seem to be about the most consistent of the new ones in use. Some of these may have been used during the war, but as far as the writer knows, they are

USA. There have been quite a new outlets.

One of the loudest is KNBI, which can be heard every night on 6.12mc. with a very loud signal and some excellent programmes. The General Electric station in Schenectady, WGEX is now using 9.67mc. in the programme heard here in the early morning, while another early morning station is the Crosley station WLWS, which is now on 11.705mc. and comes in very well indeed at most locations. Still another station in the USA which is received well here in the mornings is the National Broadcasting Company's International station WNRA, which has now taken into use the 11.87mc. channel.

One of the loudest signals on the 25 metre band at night is the Honolulu station KHRO, which has a terrific signal on their new channel of 11.89mc. This station leaves the air at 6.45 pm, so I suppose it should really be called an evening station. There may be a few more of these American stations which we have not listed, but as they are heard so well at most places we feel sure that all our readers will have already logged them.

AUSTRALIA. Some further changes have taken place in the programmes radiated from Radio Australia and amongst other changes which may have taken place we can list VLC7 which has changed frequency from 11.84mc. to 11.81mc. and also VLB3 which has moved from 11.77mc. to 11.76mc. We understand there may be a few more changes in frequency, but at the time of these notes the above two are the only ones we have noticed and which were kindly brought to our notice by Mr. Graham Hutchins, of Radio Australia. The DX session from these stations is still very popular, especially among overseas listeners, so if you have not heard it, have a listen on a Sunday afternoon at 3.25.

CHINA AND KOREA. From our enthusiastic Western Australian listener, Mr. George Major, we learn of a new station in each of the above two countries. The first is XGIO, which he reports as being on about 9.99mc., which is on the air from 10.30 till 11.30 GMT with western-type music from 11 to 11.30 GMT. It has also been heard around 1 pm GMT, but the location is as yet unknown.

The Korean station is JKAO, which operates on 9.43mc., and the schedule appears to be 10.30 to 1330 GMT. No English has been heard apart from the announcement, "This is the Korean Broadcasting System, Station JKAO." This station relays the Voice of the United States of America. Korean language programme from 11.45 to 12 GMT.

NEW STATION LOGGINGS

Call	KC	Metres	Location	Remarks
KNBI	6120	49.02	Dixon, Cal., USA	8.0 pm
WGEX	9670	31.02	Schenectady, NY, USA	7.0 am
WLWS	11705	25.63	Cincinnati, Oh., USA	7.0 am
VLB3	11760	25.51	Shepparton, Vic.	5.30 pm
VLC7	11810	25.40	Shepparton, Vic.	11.0 pm
WNRA	11870	25.27	New York, NY., USA	7.0 am
KRHO	11890	25.23	Honolulu, TH.	6.30 pm
WRUS	17750	16.90	Boston, Mass., USA	7.0 am

WITH OUR SHORT WAVE REPORTERS

MR. GEORGE MAJOR

As mentioned in last month's issue we are giving some details of one of our West Australian readers in this issue.

The reader concerned is Mr. George Major, of Manjimup, and we are indebted to the West Australian publication, "Radio Listening Post," for some information of George, who is a prominent member of the Short Wave League of West Australia, which publishes this magazine.

George Major is indeed a very enthusiastic listener and makes a point of obtaining the schedule of as many stations as possible which he forwards to various radio magazines, &c. Hardly a week passes without a letter from this listener, enclosing some details of a short wave station which usually he has obtained direct from the station concerned.

He carries out his listening in the sitting room among his family. The receivers in use are a commercial 5-valve broadcast console, together with a 3-valve Vox Adeon converter, which covers from 10 to 105 metres. This combination was used by George when he was successful in 1939 in winning the Ronfred DX championship.

A second receiver is also used, this being a 3-valve TRF, which is remarkably good for DX reception.

The aerial system used consists of an inverted L type 35-feet high and 60-feet long, running east and west. A quarter wave doublet, also 35-feet high, runs north and south. These two aerials give good reception in all directions.

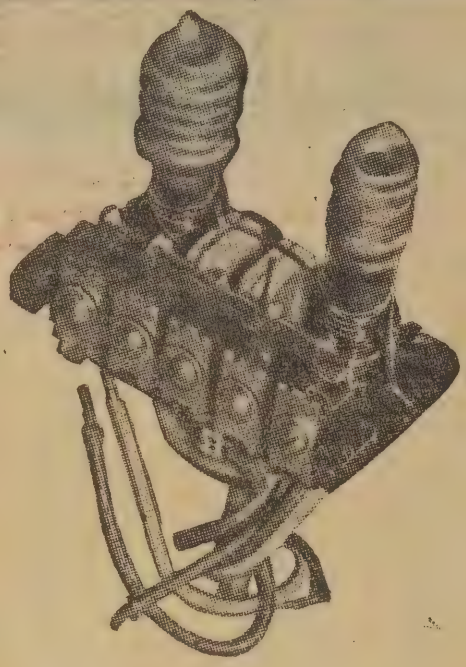
During the war years, George's activities in short waves had to take second place to other duties, but he always managed to keep abreast of news of all short wave stations, and since becoming really active again last March has received 82 verifications, with many more reports out.

On quite a few occasions he has been the first to report new stations, one of which, XLRA is mentioned in this issue.

George subscribes to many short wave periodicals, which he files for easy refereince, and if his reports are any indication of his work, his whole layout and records must be a joy to any DXer.

His only regrets are that there are so few keen DX listeners in the West and that the South American stations are so hard to log over there.

Despite the lack of South Americans we know that he manages to hear most of the other stations which are on the air. Let us hope he can infuse some of his keenness into some of the other listeners in the West as he certainly is a good example.



Crown PARTS ARE DEPENDABLE

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Plan wisely when you are building your radio set—make sure that each part of your equipment is capable of fulfilling its part 100% in the finished job.

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THE HAM BANDS WITH BILL MOORE

The proposed dates for the use of the new amateur frequencies as arranged at Atlantic City are to hand. All bands above 27.5 mc should come into use about January 1, 1949, while the lower frequency bands below 27.5 mc are not likely to be in use before September 1, 1949, and this date is subject to possible postponement.

WE look like waiting some 20 months before getting our new 21 mc. band. The ARRL has received a report on the DX possibilities of the new band, although this information only covers the USA. Over there F2 layer reflections should give very good summer time DX, while the unpredictable sporadic E clouds should provide the unusual. Similar conditions should exist here in Australia on the 21 mc. band.

For those amateurs interested in the world's communication problems, Atlantic City documents are available from the ARRL, West Hartford, at a cost of one dollar 50 cents. The combined English-French texts comprises over 1100 pages and the document can be well placed on the amateur's bookshelf.

THE UHF's.

DECEMBER, 1947, saw the 6MX band really open up and conditions during the month were the best experienced to date by UHF enthusiasts. Sporadic E clouds in the right places provided contacts between all Eastern States and from these States to New Zealand.

Saturday, 13th, was the opening day with the band open for seven hours. Hundreds of interstate contacts were made, excepting across to VK6. A number of country stations were heard in Sydney, among them VK2AHM and VK2SL.

The first contact between Tasmania and Victoria was recorded, VK3ZL and VK7XL contacting. VK7AB made 40 contacts with stations in four States and VK2ADT with 29 different interstate QSO gives some idea of the tremendous activity. It would be impossible to record all the contacts made.

Over this weekend, Dec. 13 and 14, ZL1AO heard VK stations.

The opening of communications between Australia and New Zealand occurred on the following weekend. This was a major event in VK UHF history.

On Saturday, 20th, ZL3AR was audible on several occasions, however, at 6.30 pm VK20C on 6mx. worked ZL4BN crossband to 10mx. and VK2NO repeated the contact a short while later. VK3, 5 and 7 stations could be contacted right up until 10 o'clock on this same evening.

NSW WIA UHF officer Chas. Frvar (VK2NP) made history on the Sunday morning with a two-way contact on 6mx. with ZL3LB, time 8.15 am.

This contact was closely followed by contacts between ZL3LB and VK2WJ, VK2ZH and VK2OC in that order. As the day progressed two-way work with New Zealand was commonplace and since that date the band has been open to NZ on a number of occasions. ZL stations have since worked with VK3, 4 and 7 stations.

In the DX heard section we record VK2CI hearing KH6 and J, VK2ADE-KAIAP and VK3RR a KH6. VK2NP during the month contacted VK2GU in Canberra. VK2JU's channels with 2TA, 2TC and 2GU have been most consistent. One contact with 2GU lasted for over two hours.

THE EMPIRE DX CERTIFICATE

AN entirely new certificate for DX work has been announced by the Radio Society of Great Britain. It is an award that will be even more coveted than the DXCC and amateurs to qualify will have to break all DX records.

The certificate will be issued to amateurs who submit evidence of having established:—

(a) Two-way contact on 14mc. with amateur stations situated in 50 Empire countries or call areas.

(b) Having made two-way contacts with 50 different Empire countries or call areas on any other bands other than 14mc. band. When the new 21mc. band opens a special certificate will be issued covering operation on this and other bands.

A minimum readability report of R3 and a tone not worse than T8 must be recorded on the QSL cards submitted.

Certificates will be issued to non-member at a cost of 2/6. Full country and call area listed have been published in "Amateur Radio."

AMERICAN REGULATIONS

THE ARRL is pressing for several changes in the regulations covering amateur stations in the US. Firstly is a request for mobile operation on all amateur frequencies by stations at any stage, without prior permission being granted. Another regulation that has proved a boon to operators using break-in is the necessity of identification only at 10-minute intervals. The change eliminates unnecessary signing after every short over. A change of this sort cuts break-in QSO's by quite some time.

Local authorities are worried about the indiscriminate use of VFO's. It is only a small percentage of operators who use the VFO thoughtlessly. The VFO is a necessity in the crowded bands these days and it's a pity that amateurs can't refrain from sliding up to stations transmitting and interjecting—it may be funny to some but the great majority of amateurs don't think so.

Since their introduction the problems of bad notes from VFO's have been corrected—let's clean up their indiscriminate use.

DX AND PERSONAL

STations have not been audible on 20 metres during most of our DX hours. The result being some fine DX has been breaking through clear of QRM.

Better Africans breaking through include CR6A1 14070, ZD1KR 14100, FT4AE 14170, FT4AN, 14025, FT4AO 14110, ST2KR 14075, EK1AA 14050, TINS 14000 and ET3Y 14005. Audible 1750 to 1900 hrs and 0500 to 0700 hrs. East.

The prefix for Eritrean stations has been changed from 16 to M1.

Choicest phoneys of the month PHTEN, GBBB and VNHF.

The small country of Liechtenstein is represented by HE1CE 14050 and HE1EL 14055, both at 1900 hrs.

VQ3HJP was over in Zanzibar signing VQ1HJP for a few weeks, he promises to QSL—The other station signed VQ1 is reported a phoney by the beam boys, signal from the wrong direction. EP1AL's cards to W2ZJ, or via ARRL, will QSL to help the DXCC along, he has left for USA to get married.

HC1ES reported as 100 per cent. QSL.

YL VK2APR is an object lesson in precise operating technique to the "roger dodger" operators heard so often these days.

OFF THE RECORD — NEWS & REVIEWS

Record lovers will sincerely regret the death of Richard Tauber, who was to return to Australia this year. There is no question that we have heard for the last time one of this century's finest tenors.

By JOHN MOYLE

EVEN those who did not always appreciate his ventures into popular numbers will agree that in Mozart and Lieder particularly, he was always a master.

How fortunate we are that there exist so many splendid records of his singing, including many, I think, not yet issued. By these, he certainly will not be easily forgotten.

COUPLED SETS

From now on, all issues of more than two records will be "automatic couplings," which means that, where possible, successive sides will be found on different discs. If two turntables are used, or record changers, this will allow a continuous performance to be arranged. A very good move, and one we have always considered to be for the better. To date, automatic couplings have only been available by special order.

JEAN POUGNET, Violinist, and Royal Philharmonic Orchestra, cond. by Sir Thomas Beecham—"Concerto for Violin and Orchestra" (Delius) (5 parts) and "Prelude to Irmelin" (Delius) (Orchestra only). (Recorded under the auspices of the Delius Trust.) HMV ED.536/8.

It is not so long since we had a recording of this concerto as played by Sammons and the Liverpool Orchestra. It is an interesting experiment to play them side by side, although it was difficult for me to decide which I really preferred. Both are exceedingly good interpretations of a work which is not easy for many violinists to do really well.

I think finally that this new recording would get my vote. Technically, it is better, there being some really fine passages for both orchestra and soloist. There are times, also, when Sammons is a little too lush. Pougnet stands a little further away from the music, with good effect. Beecham, of course, is completely at home with Delius.

He takes it a little faster than Sammons, ending up on the fifth instead of the sixth side.

Altogether, a fine release which might well become the favorite to date.

BBC SYMPHONY ORCHESTRA—Conducted by Sir Adrian Boult—"Cappriccio Italien" (Tchaikovsky). HMV ED.539/40.

Everyone likes this music, and here they get it with a most impressive re-recording. It is something of a gentlemanly performance, but it has plenty of weight in the right places, plus good, co-ordinated playing. My only criticism is that I like a little more abandon where appropriate, something that only a few English conductors seem willing or able to give. But that's a minor point—don't let me scare you off a splendid piece of work. You owners of good gramophones will get a a thrill from it.

LONDON PHILHARMONIC ORCHESTRA—Conducted by Sir Thomas Beecham—"Symphony No. 97 in C Major" (Solomon Set, No. 1) (Haydn). HMV ED.533/5.

Very, very Beecham in all its phases. Most carefully considered, rehearsed and presented with meticulous attention to every phrase. In no section is this smooth moulding seen more clearly than in the second movement, which, of course, lends itself so well. For this reason it may seem a trifle ponderous, when compared, for instance, with Toscanini's approach to Haydn. But, at least, there is very little missed in the music, and still less in the recording. I thought it smooth and well balanced.

The symphony is fairly well known and doesn't call for much comment. Personally, I don't think it is attractive as some others, but that is only a personal matter. Automatic couplings, in accordance with the new custom.

EVELYN ROTHWELL, Oboist, with Halle Orch., conducted by John Barbirolli—"Oboe Concerto" (Corelli). HMV EB.404.

As gracious a piece of work as one could wish to hear. With the Halle conducted by Barbirolli, and his wife playing the oboe, one could only expect this to be so. You can put your hand in your pocket right now for this one.

GINETTE NEVEU, Violinist. Piano acc. by Jean Neveu—Four Pieces, Op. 17 (Sak). No. 1—Quasi Ballata; No. 2—Appassionato; No. 3—Un poso triste; No. 4—Burleska. HMV ED.541 and ED.542.

Brilliant, masterly playing. This lady will cause something of a sensation when she arrives, if work such as this is a lead. She is the same who gave such a marvellous performance of the Sibelius concerto released a few months ago. The composer is fairly well known for music of this type—brilliant, quaint, plaintive and fascinating. Special mention should be made of the accompanist, who bears the same surname.

The recording is particularly vivid and for this reason you may find your needle wearing before the record ends. These records will delight you whether for the music alone, or for the quality of the recordings.

EZIO PINZA, Bass, with the Metropolitan Opera Orchestra—Conducted by Bruno Walter—"Magic Flute—Qui Edegno Non S'accende" (Within These Sacred Halls) (Mozart), and "Il Seraglio"—Osmin's Aria (Oh, How I Shall Triumph!) (Mozart) (Sung in Italian). COLUMBIA LOX.639.

One more fine record from one of my favorite bass singers. What a voice he has! This plus personality and artistry give authority to everything he touches.

REGAL-ZONOPHONE

LES BROWN AND HIS ORCHESTRA—"Don't Tell Me" and "Fine Thing." G.25179.

BUDDY CLARK WITH ORCHESTRA—"Peg o' My Heart" and "All by Myself." G.25182.

ROY ROGERS WITH ORCHESTRA—"On the Old Spanish Trail" and "I've Just Got to Be a Cowboy." G.25183.

FELIX MENDELSSOHN AND HIS HAWAIIAN SERENADERS, featuring Harry Brooker on Electric Hawaiian Guitar—"Paradise Isle" and "Beautiful Dreamer." G.25163.

ROY HALL AND HIS BLUE RIDGE ENTERTAINERS, String Band and Singing—"Little Sweetheart, Come and Kiss Me" and "'Neath the Bridge at the Foot of the Hill." G.25164.

IRISH GUARDS' BAND—"King Cotton" and "The Gladiator." G.40326

LES BROWN AND HIS ORCHESTRA—"Sentimental Rhapsody" and "Oh! My Achin' Heart." G.25181.

DECCA

DEANNA DURBIN WITH ORCHESTRA—"The Turntable Song" ('Round an' 'Round an' 'Round) and "You Wanna Keep Your Baby Lookin' Right." Y.6067.

RALPH MENDEZ, HIS TRUMPET AND HIS ORCHESTRA, under the direction of Victor Young—"Flight of the Bumble Bee" and "Hora Staccato." Y.6054.

BING CROSBY AND THE JESTERS—"It's the Same Old Shillelagh" and "When Irish Eyes are Smiling." Y.6070.

BING CROSBY AND THE JESTERS—"Who Threw the Overalls in Mrs. Murphy's Chowder?" and "Feudin' and Fightin'." Y.6068.

THE ANDREW SISTERS WITH ORCHESTRA—"A Rainy Night in Rio" and "How Lucky You Are." Y.6069.

PARLOPHONE

JOE DANIELS AND HIS HOTSHOTS IN "DRUMSTICKS"—"Boogie Boots" and "Back Bay Shuffle." A.7639.

DUKE ELLINGTON AND HIS ORCHESTRA—"The Sergeant was Shy" and "Boy Meets Horn." A.7643.

RICHARD TAUBER, Tenor, with Orchestra—"The Dove" and "Beneath Thy Window." AR.397.

WILBUR KENTWELL AT THE CONSOLE OF THE NEW HAMMOND ORGAN—"Themes from Conflict Concerto" (Pt. 1) and "Themes from Conflict Concerto" (Pt. 2) (Kentwell). A.7640.

"Country Gardens" (P. Grainger) and "Valse—Introducing—Dance of Columbine" (J. Brash) and Lofette (Horne). A.7641.

"Invercargill"—March (Lithgow) and "Supremacy" — March (J. Godfrey). A.7642.

HMV

THE THREE SUNS—"Across the Alley from the Alamo" and "If I Had My Life to Live Over." EA.3618.

NOEL COWARD—"This is a Changing World" and "Uncle Harry." EA.3619.

BARNEY BIGARD AND HIS ORCHESTRA—"Charlie the Chulo" and "Linger Awhile." EA.3620.

HM KING GEORGE VI—"A Message to the Empire"—Parts 1/2 (Broadcast on Christmas Day, 1946). REB.406.

FREDDY MARTIN AND HIS ORCHESTRA—"Lolita Lopez" and "I Won't Be Home Anymore When You Call." EA.3627.

PHIL HARRIS AND HIS ORCHESTRA—"Smoke, Smoke, Smoke (That Cigarette)" and "Pray for the Lights to Go Out." EA.3628.

PERRY COMO WITH ORCHESTRA—"Chi-Baba Chi-Baba (My Bambino Go to Sleep)" and "When You were Sweet Sixteen." EA.3629.

TEX BENEKE WITH THE MILLER ORCHESTRA—"Oh! But I do" and "A Gal in Calico." EA.3624.

VAUGHN MONROE AND HIS ORCHESTRA—"You Do" and "Kokomo, Indiana." EA.3625.

ANSWERS TO CORRESPONDENTS

HOW TO SUBMIT YOUR QUERY

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.

2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."

3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."

4. Blueprints of exact size chassis layouts with all essential holes and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2728C, GPO, Sydney.

A.S. (Glen Iris, Vic.) writes in appreciation of "Radio & Hobbies" and says he has built up a very small set using the IQ5-one circuit but with a 3S4.

A. Many thanks for your letter and subscription and for the details of your little set. We trust that you will continue to find much of interest in "Radio & Hobbies."

G.J.M. (Magill, Sth. Aust.) forwards a remittance for the "Australian Short Wave Handbook." Also submits some circuits for comment.

A. By the time you are reading this, G.J.M., you will, no doubt, have become familiar with the contents of the "Handbook." The circuits which you enclosed are not suitable for publication, because they have already been published in other magazines. However, we thank you for your interest. The VFO is of the ECO type with the two condensers, C3 and C4 electrically adjusting the tap on the coil for the cathode connection. The grid resistor in the circuit of the 163mcs. super grid regenerative receiver is actually 1 megohm in value, although higher values may be used.

A.J.E. (Inverell, NSW) in writing for the "Australian Short Wave Handbook," asks for a chassis wiring diagram of the "Senior Seven," published in the August, 1939, issue of "R. & H."

A. No doubt you received your "Handbook" some time ago. Very sorry, A.J.E., that we are unable to assist with the particular wiring diagram. No prints are left in our files and the actual blocks are not now available. We suggest, however, that you advertise for the particular issue either through the "Wanted to Buy or Exchange" column, or through any other avenue of which you have knowledge.

W.H.S. (Mt. Perry, Qld.) suggests that we should allot some space to receivers for 12 and 32 volt operation.

A. We agree that there may be interest in receivers of this type, but it is simply one of those designs which we have not yet got around to tackling. The idea of using AC tubes in the 12 volt system is in order except that greater economy of operation can be achieved with battery valves or a mixture of both types. It is also possible to connect a resistor in series with the separate driving contact of some vibrators, but we are not in a position off-hand, to suggest the correct value for certain conditions. A process of trial and error, using an appropriate volt-meter would appear to be the best way out of this difficulty.

C.G. (Coburg, Vic.) is interested in the 6-metre converter described in the August issue and asks whether it can be expanded into a complete double frequency change superhet.

A. A set could be built along the lines you mention, but very careful filtering and shielding would be necessary around the second oscillator to prevent spurious responses being fed back into the aerial terminal. The same 10-megacycle coil could probably be used though it would be preferable to employ a properly designed 10Mc double tuned transformer in this position. We regret that we cannot give you off-hand the design for this transformer, or for the oscillator coil necessary to reconvert to 465kc. There would probably be no need for more than one transformer, the signal from the mixer feeding straight into the grid of the next frequency changer.

R.J.B. (Wellington, NZ) speaks of the interest which he finds in "R. & H." magazine. He asks for suggestions as to a suitable receiver for DXing. A further question is in regard to an aerial in the roof of the house.

A. Our suggestion for a suitable receiver for your purposes, R.J.B., is the "Communications Nine" featured in the February, 1947, issue, or the "2JU Straight Eight," featured in the "R. & H." production, "The Australian Short-Wave Handbook." The suggested type of aerial for indoor use is governed more or less by the available space, but we suggest you run the wire round two sides of the space under the roof, bringing the end down as a lead-in to the set.

THE following reprints are available on application at our office, 60-70 Elizabeth-street, Sydney. They will be sent, post free, on receipt of stamps or postal notes.

How to build a Synchronous Clock.
4 Pages 1/-

A Pendulum Type Electric Clock.
8 Pages 1/-

Build Your Own Windcharger.
8 Pages 1/-

Coil Details for Small Receivers.
1 Page .. .. 6d.

Radio Circuit Symbols.
1 Page .. .. 6d.

Collecting Verification Cards.
1 Page .. .. 6d.

A.F. (Rylstone, NSW) wishes to operate a 2-volt commercial set from a 32-volt lighting plant.

A. The matter of operating your set directly from the lighting plant involves a number of complications which render the idea somewhat impractical. First of all a dropping resistor would be needed for the filaments which would involve a large wastage of power. Alternatively, if the filaments were connected in series-parallel, the bias arrangements would be upset and the whole circuit would have to be redesigned. The high tension supply also presents a problem, as vibrator units are not ordinarily available to operate from 32 volts. The most practical scheme for the filaments appears to be to charge your present accumulator from the plant. You could probably do this by placing the small battery in series with the main bank when on charge. A possible solution to the high tension supply problem may lie in some of the 28 volt genemotors available through Disposals channels. We suggest you keep an eye on the dealers' advertisements.

T.J.McN. (Otautau, NZ) finds a requirement for the "Australian Short Wave Handbook" and speaks well of the "1941 Majestic Radiogram."

A. The "Handbook" is on the way to you, T. J. McN. We are very pleased to note the success and satisfaction with the Majestic Radiogram. Also, we reciprocate your good wishes for the New Year.

F.G. (Tumblong, NSW) sends along a six months subscription and suggests a series of articles on elementry theory. Also asks a question concerning the "Duplex Single."

A. Thanks for your subscription, F.G., which has been dealt with in the normal manner. We have no immediate plans for a review of circuits. Special articles for beginners have been running since November last. The condenser C1 in the circuit of the "Duplex Single" may be from .00038 to .0005mfd. The exact size is not of great importance, apart from the fact that the tuning range alters with condensers of different capacitance. The condenser C2 is used for bandspreading on the short waves and is a small condenser of 2 or 3 plates.

M.L. (Yambuk, Vic.) advises of a change of address. He finds the beginners' article interesting and is pleased with the results from a 2-valve set which he has built.

A. Your change of address has been taken care of, M.L. Pleased to note your interest in the beginners' section. This section will continue for a number of issues and will deal with most of the points and the components mentioned. A carbon microphone may be connected to the pick-up terminals of a receiver provided a suitable transformer is used. The resulting output will depend upon the quality of the microphone. In the case of the low output high fidelity microphones, a stage of pre-amplification would be required.

K.E.R. (Richmond, SA) writes in appreciation of "Radio & Hobbies" and requests a copy of the "Short-Wave Handbook."

A. Your copy of the "Handbook" has been forwarded and we have no doubt that you will find it to contain just the information you desire.

ANSWERS TO CORRESPONDENTS

J.S.P. (Malvern, Vic.) writes in for data on a coil with reaction for operation on the band of 160 mcs. to 170 mcs.

A. It is more or less accepted that the usefulness of a conventional regenerative detector ends around 30 mcs. It would be of interest, however, to discover by experiment the performance of modern midget valves on the 160 to 170 mcs. band. The number of turns on a self-supporting coil for that band will be in the region of four, with a diameter of approximately ½-inch. The number of turns for the reaction winding will need to be found by experiment, with due consideration to the increased circuit losses in the UHF bands.

N.A.C. (Millmerran, Qld.) writes to request a copy of the "Australian Short Wave Handbook." He owns a set of extremely ancient vintage and feels that the articles for beginners will assist him to understand the complexities of present day circuits. Also registers disappointment in a certain set from Disposals which does not go far enough into the short wave spectrum.

A. Your request for the "Handbook" has been duly dealt with, N.A.C. We are pleased to note your interest in the beginners' articles and trust that they will assist you in some way. The use of the converter, described in the January issue of "R. & H.," with your broadcast receiver will enable you to cover the general short wave bands.

E.N. (Wollongong, NSW) writes in appreciation of the series of articles for beginners. He would like to know what help a certain piece of Disposals equipment would be to him as a beginner.

A. We are very pleased to note your interest in the beginner series, E.N., and hope that each new article of the series will be of help to you. The actual value which Disposal equipment would be to anybody depends largely upon the individual. One large factor, though, is that it is a cheap way of acquiring many bits and pieces for experimenting or definite construction. On the other hand, the particular piece of equipment which you mention is useful for short wave listening, though the band coverage is rather limited. It could be extended, however, to suit individual requirements by the use of a suitable converter. The transmitting portion, naturally, may not be used unless the user is in possession of an experimental station licence issued by the PMG.

J.P. (Elwood, Vic.), hopes to become an amateur in the near future. He expresses his appreciation of "Radio & Hobbies" but would rather see a greater proportion of constructional, to theoretical and popular science articles.

A. Many thanks for your letter, J.P., and we certainly hope you soon have that "Ham Ticket" and are able to join in the fun on the air. We agree that many of our readers would rather have a greater number of practical articles but then there are others who enjoy the general interest articles and are not so keen on the practical work. However readers' letters are always welcomed because they tell us what you want to read about.

T.B. (Rockdale, NSW), sends in a subscription and suggests that readers would be interested in an article on wire recorders. He enjoys "R. & H." and particularly mentions the "Serviceman Who Tells" and the articles on the big sets, such as the "T.R.F. Radiogram."

A. Many thanks for the subscription and we are glad to hear that you enjoy our magazine. We agree that many readers would like to see an article on wire recorders and we will keep your suggestion in mind for the future. The actual construction of such a unit would probably be something of a problem at present since to our knowledge the specialised components required are not available through the usual channels. Also there is no apparent supply source for the wire.

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Comets Wander Through Space

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known are in a process of wasting away, for on each return to visibility they show evidence of decreasing brilliancy, which suggests that their materials are being distributed along their orbits, and are the source of many of the meteors and shooting stars so often seen.

It is certain that such a large area as a comet offers to the disruptive influences of the sun, and large planets have an ultimate effect of disintegrating the original mass and dispersing it over a very large arc of the heavens, or perhaps over the entire orbit of the comet. It may be that the measurements of the size of comets are far below the actual figures, for the visible portion of the mass is the only portion which can be measured. It is probable that the entire mass is not visible and may be scattered over a far greater area.

The nucleus is the condensed portion of the comet which disintegrates as it flies through space at a speed of hundreds of miles per second. The great comet of 1882 attained a speed of about 400 miles per second. This speed varies according to the distance of the comet from the sun. At a distance corresponding to that of the earth from the sun, 93,000,000 miles, the speed of a comet is about 20 to 25 miles per second owing to the retarding influence of the sun's attraction.

This, then, is the story of comets so far as is known today. Much still remains to be discovered about these singular bodies, which are perhaps the most interesting of all celestial objects owing to the uncertainty of their apeparance and behavior.

SERVICEMAN WHO TELLS

(Continued from Page 49)

Talk of power transformers recalls a tricky fault I had to locate a couple of months back. Leastwise the trouble was normal enough, but it had me guessing for a few minutes because of its effect on voltage readings.

When I got the set it hummed but gave little other sign of life. I naturally suspected the power supply and quickly located a burned-out back-bias resistor. Normal explanation for this is a short from B-plus to chassis, probably a broken-down electrolytic or tubular condenser.

I duly replaced the burned-out resistor and the electrolytic condenser across it, and checked continuity from B-plus to chassis. But there was no short or any other sign that there had ever been one. So, with some misgiving, I switched on again and noticed immediately that the transformer was humming and my new resistor began to heat up. A quick check on B-plus showed a low but rather tremulous voltage. There must be a leak! But no, the resistance from B-plus to ground was no less than the resistance of the voltage divided. What the heck! Not wishing to burn up anything I pulled out the rectifier and prepared to measure the a-c volts around the transformer. But again the hum and the back-bias resistor began to heat, showing that there were many volts across it. So I disconnected the resistor and started measuring things.

SHIELD SHORT

The secondary voltage read just under 400 on each side of the centre tap, showing that there were apparently no shorted turns. But wait! From one side to chassis read zero volts; from centre-tap to chassis read 400 and from the other side to chassis read 800.

Light dawned and I disconnected the electrostatic shield from chassis and found a dead short between it and the inner end of the high tension winding. Actually the shield is a metal foil between the primary winding and the secondaries and is intended as a precaution against hash and modulation effects. Apparently the insulation between this and the inside layer of the secondary had punctured, allowing one turn to short through.

The presence of such a breakdown may have meant that a general short would have developed across this layer, so I replaced the transformer with a new one and returned yet another serviceable chassis.

Incidentally, I recollect one enthusiast winding a transformer ever so carefully, only to see it go up in smoke a few moments after it was switched on. He had wrapped on the metal foil around the primary but forgot to insert insulation between the overlapping ends. The shield therefore acted as a shorted turn. Yet another trap for young players!

WANTED TO BUY SELL OR EXCHANGE

ADMIRALTY' Radar, suit 170 m/c, several new, 3ft. rack, 3 units:—12 tube rec., 4 tube tx. inc. 2 micropup, blower and code motors, 50 ma. meter, 32V4A. Sel. Rect., £12, F.O.R. R.F. meters 0.3 and 1 amp, 15/- ea. No. 11 Transc. 3-pin connectors, 9d. **VK2IK, 26 Winifred-ave., Epping, N.S.W. WM2935.**

EXCH.: 1B eliminator (cost £5/15/-), for 1 or 2 v. batt. set, minus batt.; also 58 valve, 5/-, new. **Greenwood, Hamlyn, Main Western-rd., Wentworth Falls.**

FOR SALE: Complete loose copies of "Radio and Hobbies" from April, 1942, to December, 1947. **S. Kerr, 12 Barkly-street, Maryborough, Vic.**

FOR SALE: M.C.A. Palec multi-meter with 5-amp shunt. Almost new. Complete with carrying case, £10. **J. S. Fisher, Gracemere, via Rockhampton, Queensland.**

FOR SALE: (1) 1D8GT, 22/6; (1) 1A7GT, 16/-. Both new and unused. **K. A. Ogden, 45A Broughton-st., Milson's Pt.**

FOR SALE: P.A. system, 15w. A.C., or 32v. D.C., mic., speakers, P.U., records, best offer. **J. Jackson, 131 North Steyne, Manly.**

FOR SALE: 9-valve S.T.C. communication receiver, 4 bands, 1.5 to 24 mcs; crystal filter, BFO; 240v. A.C., excellent appearance and working order, £40, plus freight. **A. MacIver, Dutton-st., Hawthorne, NE1, Brisbane, Qld.**

FOR SALE: 3-gang condenser, complete three stage RF dual wave coil assembly (mounted with switch, padders, etc.), also IF's, 6U7G, 6A8G valves (in cans) and Radio & Hobbies, May, '44, to June, '47. What offers? Wanted, electric gramophone motor. **M. McLauchlan, Coffs Harbor P.O., N.S.W.**

FOR SALE: Two type PA7 Amplion permag. speakers. **J. Nixon, William-st., Port Macquarie.**

FOR SALE: Transformer, 900-0-900 volts, 250 mill. Offers? **A. Springett, 16 Chiltern-road, Willoughby, N.S.W.**

MAGAZINES: Over 500 copies of The Aeroplane, Popular Flying, Aero Digest, Meccano Magazine and Scientific American. What offers? Either sell or exchange in full or part for 35mm. camera or radio gear. **A. K. Head, 12 Peverill-street, Balwyn, Vic. WF8212.**

POWER Tran., 385-0-385/150 ma. RCA filter choke, 100 ma., output tran., 10,000 C.T. (slightly used). Valves (new), 2 x VR150's-30; 5V4G; 807; 2 x 6K7's; 6A6; 6 x 5 GT. Valves slightly used. 6U5/6E5; 4 x 6J7's; 2 x 49's; 19; 2 x 6V6GT's. Lot £14. **R. J. Moore, "Deer Park," Elmhurst, Vic.**

SALE: One Amplion 12P64 per-mag. speaker, new, complete with two output transformers, 10,000 ohm C.T. and 14,000 ohm C.T. One Astatic crystal pick-up as new. One Reiss microphone. Wanted automatic record changer, in or out of order. **V. Groves, Light-st., South Casino. N.S.W.**

SALE: Army No. 11 transceiver, 9 valves, meter, 2 genemotors. Range: 4.2-7.5 megs, continuously; 807 output, suitable amateur station, as new, £15/10/-, or offer. Also Army 108 portable transceiver uses common battery valves, extending aerial, no batteries or valves, good condition, £8, or offer. **D. Guyatt, 58 The Parapet, Castlecrag, Sydney. XL1905.**

SELL: AW3B transmitter, £8; 1133D transceiver, containing 14 American base valves, £9; AT5-AR8 equipment, three units, £27. **R. M. Long, N.Y. Hotel, 153 George-street, Sydney.**

SELL: 813's, 866A's, new; plate transformer, 1500/1500 300 mA. What offers? Write **O'Brien, 27 Dolphin-st., Randwick.**

SALE: R. & H's, 1943, Jan.-Dec. (inc.); 1944, Feb.-Dec. (inc.); 1945, Feb.-Dec. (inc.); 1946, Feb.-Mar.-Apl. Offers? **T. V. Kimber, 247 Cross Roads, Cabra, S.A.**

SALE: "Amature Junior" Receiver (6J8, 6U7, 6J7, EL3, 80), with Rola K5; 40 and 80 and B/C coils, £12, plus freight. **M. Laybutt, 3 Oxley-st., Kingston, Canberra.**

SALE: 63 different R. & H. to Dec., 1945, £3½. 7168 K.C. Crystal in holder, 30/-. **Bidgood, Dea Why, XW8324.**